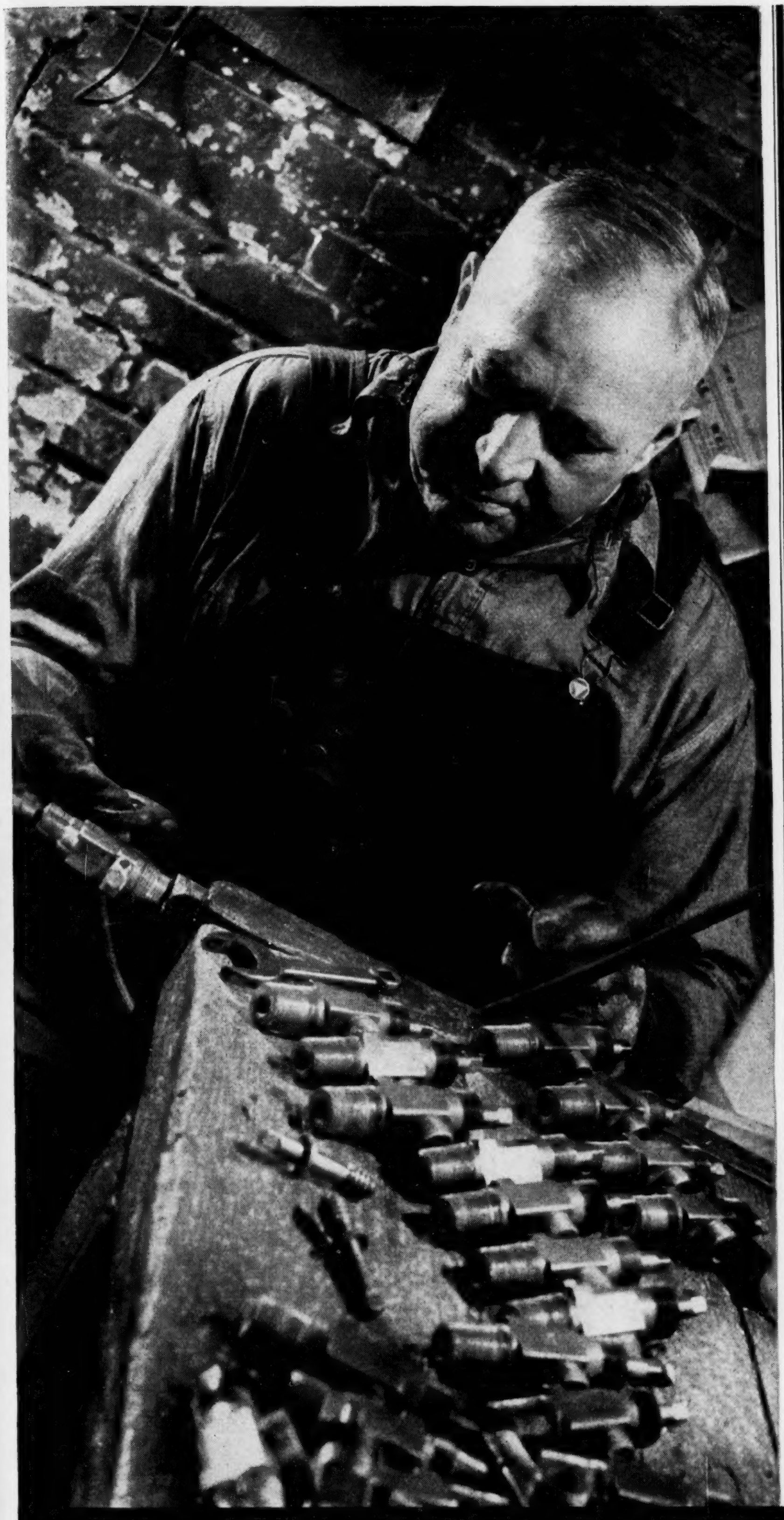

# VALVES *be Seated!*

•

TO good-natured Charlie Elstrodt, every chlorine cylinder valve is leaky until his own "personal" test proves it is tight. Because of Charlie's hard-boiled philosophy, because of the sureness of the compressed air test, mighty few leaky valve seats have gotten by Charlie's inspection in his sixteen years at Mathieson's Niagara Falls plant.

Charlie's job is one of about nineteen different steps in the cleaning, reconditioning and inspection routine through which Mathieson Chlorine cylinders and valves must pass before they are shipped. And in each of these operations it is men like Charlie Elstrodt, men who keep their eyes "glued on the ball", who give Mathieson's cylinder routine the backbone which makes it valuable to you.

Mathieson engineers produce chlorine of a purity second to none; and Mathieson workmen see that you get this pure product in clean, smooth-functioning containers. Couple with this Mathieson's unusual traffic and delivery facilities and their expert technical service and you see why this company presents a chlorine team that is hard to beat.

*The* MATHIESON ALKALI WORKS *(Inc.)*
60 East 42nd Street New York, N. Y.

# MATHIESON CHEMICALS

SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . LIQUID CHLORINE . . . BLEACHING POWDER
HTH AND HTH-15 . . . AMMONIA, ANHYDROUS AND AQUA . . . PH-PLUS (FUSED ALKALI) . . . SULPHUR CHLORIDE
CCH (INDUSTRIAL HYPOCHLORITE) . . . DRY ICE (CARBON DIOXIDE ICE) . . . ANALYTICAL SODIUM CHLORITE

# The Reader Writes:—

## Phenyl Mercuric Nitrate

In reading your August issue, we noticed the article, on page 173, called "Mildewproofing Textile Fibers," by J. Hendrik Hutten.

In this article, on page 174, the third paragraph, Mr. Hutten describes phenyl mercuric nitrate. We have been selling phenyl mercuric compound for the past two years and feel that some correction should be made in his article.

The most important correction is the fact that a pure grade of phenyl mercuric acetate can be bought for less than half of the price that he names for the nitrate. Secondly, a technical grade of phenyl mercuric nitrate of very high purity can be bought for slightly over half than the price he mentioned for phenyl mercuric nitrate in his article.

In regard to his objections for disbursing it in water, the following procedure can be used. The amount of phenyl mercuric nitrate that is wanted is disbursed in warm alcohol. One or two drops of ammonium hydroxide are then added. This will give a crystal clear solution of phenyl mercuric nitrate. As much as one part to 1200 parts can be dissolved by this method.

We feel that, for the interest of some of your readers who have read this article and perhaps wish to use phenyl mercuric nitrate, the above information would help them greatly.

Chicago, Ill. J. H. DELAMAR
J. H. DeLamar & Son

## Likes Statistical Section

As a subscriber, may I say the articles offered in your magazine show careful study and a thorough knowledge of the subject. The supplement each month is of great value to many who study and depend on statistics in attempting to forecast business conditions.

Fort Smith, Ark. ANDER K. ORR
Athletic Mining & Smelting Co.

## "Proof" of the Pudding

The writer wishes to extend his sincere thanks for your editorial comment in the August issue just received. The facts as outlined are accurate and to the point, and should go a long way to place industry on guard against future bureaucratic action by the Federal Trade Commission which might involve all who may use the word "proof" in any capacity.

New York City E. P. BALLING, PRES.,
The Lumino Co., Inc.

## Persistence Will Be Rewarded

The March issue of CHEMICAL INDUSTRIES arrived yesterday, and upon examination, I wrote your company this morning that I felt it to be needed by all in the chemical and related industries. It certainly is the "stuff" for any industrial chemist.

I am one of the little army of June '38 graduates who is still looking for a job in industrial chemistry, and whose contacts have failed him, just as other contacts have failed 39 of the 40 other men in his class. So, I sit at this typewriter applying from Maine to California for a position, in plant operation, in laboratory control or analysis work, and in sales work, at which I am said to be especially good. So far all my applications have led to no good end, and my letters of refusal now weigh about seven pounds. But, darn it, I'm not at all discouraged. As long as my postage money holds out, so long, and longer will I hold out for a CHEMICAL job, in the chemical industry.

Norfolk, Va. MICHAEL H. BAKER

## Reporting from an Employe

I am glad you drew attention to the Employe Reports that some of the corporations are getting out, and I trust other companies will follow this lead. I am sure our top executives and department heads have no notion how many of their own people are no longer the loyal, faithful workers that they formerly were and how much resentment is raised up by dividends and bonuses that are not understood by the rank and file. It is clear that better mutual confidence must be restored, and it will not be a short or easy task to offset all the communistic propaganda that is being poured out on all sides.

New York City CHAS. H. FOSTER

## Labor and the Public

Your recent editorials and articles on the chemical industry's relations with labor and the public are most constructive, and I trust you will keep on in this vein.

The younger leaders of the chemical industry, Messrs. Queeny, Dow, and Merck, to name a conspicuous trio, are, in my humble opinion, men of vision in these matters; but they need such encouragement and support as you are giving their modern ideas.

Money isn't the sole root of all evil. Wages are not the only cause of industrial strife and dividends are only part of what the public looks for from a progressive corporation. There is no other group of companies in the country more intelligently administered than are our larger chemical manufactories. They support research and they work on the principle that bigger volume at less cost can be sold at lower prices—with a greater net profit. Where is there another industry that will as quickly discard an old process or adopt a new apparatus? Nevertheless in labor relations and even more so in public relations they are by comparison mid-Victorian in many of their ideas. Thanks for pointing out the ways and means of complete modernization.

Evanston, Ill. ARTHUR MARTIN

## We Serve as Loudspeaker

Most all the talk about employment and wages ignores entirely the wholesale and retail trades and the various services, as well as generally ignoring farm workers. Industry gets all the blame, yet the latest figures from the U. S. Department of Labor showed that in May when 180,000 workers were laid off by the manufacturers, the wholesale and retail stores laid off 195,000. Furthermore, the railways laid off 8,000 in the tenth month of consecutive reduction and the coal and metal mines laid off 17,500.

Why not broadcast these figures and point out that in that same month the chemical employment index stood at 107.6 of the 1923-25 average, against an "all industry" index of 77.4.

Salem, Mass. J. H. DAHL

CHEMICAL INDUSTRIES

*The Chemical Business Magazine*





## "Chemicalization"

WE speak a little boastfully of the chemicalization of industries whose operations are essentially chemical in character or in raw materials. We imply that they are becoming chemically conscious; recognizing the chemistry involved in their processes; exercising chemical control over their production; employing what the late John Teeple aptly called "chemical intelligence." By these implications we reveal our wish that these great chemical consuming industries may identify themselves with both our scientific and our economic interests.

This wishful thinking betrays us into the absurdity of including the motorist's gas tax in the total revenues paid to the Government by the so-called chemical process industries. Vain and selfish self-aggrandisement of this kind is not only silly; but it is also most unwise. It justifies to an unfriendly critic the inclusion of the low wages paid to girl packers in cosmetic factories to pull down the average wages paid by the chemical process industries so-called.

Last month we printed a letter from a man in the coatings industry, protesting that "chemicalization" does not make paint, petroleum, glass, textiles, etc., "a tail to the chemical industries' kite." We should consider his blunt, but friendly words.

To encompass all these fields with common bonds of technical and commercial interest, would be mutually advantageous in many ways. All these industries operate more or less upon a chemical basis, and with greater chemical consciousness they will naturally employ more chemically trained men and eventually buy more chemicals. But their chemists and chemical engineers are specialists; and as industries they are consumers, not producers, of chemicals.

Therein lies the secret of our proper relationships. They are our highly specialized customers. It is as such that we must serve them. Our chemists must interpret for them the new scientific discoveries. Our engineers must instruct them in the latest operating technique. Our laboratories must create new chemical tools for their use. Our salesmen must be true chemical missionaries. The closer we can bring them within the chemical fold, the better for all. But to expect them to join our technical societies and our trade associations; to research in pure chemistry or to support a chemical tariff; to call themselves, or to think of themselves, as chemical process industries, is futile and foolish.

Williams Haynes, Publisher and Editor; A. M. Corbet, and W. J. Murphy, Associate Editors; W. F. George, Advertising Manager; D. O. Haynes, Subscription Manager; J. H. Burt, Production Manager.

### *Profits in a Declining Market*

We have become rather sickeningly familiar with that price chart printed on our "We" page which shows that values declined for thirty years after both the Napoleonic and Civil Wars and that prices since the World War have conformed most strikingly to the traditional post-war pattern. There is a crumb of comfort to be picked up in the knowledge that there is a period of rising prices roughly twenty years after a great war and that we may reasonably expect the lift that began in 1933 to last a couple of years longer. Moreover, there are two lessons that may plainly be read from these familiar peaks and valleys. The first is that commodity prices continue to decline until they have reached a point lower than they were at the outbreak of the war. The second is that the price fluctuations, both upwards and downwards, have been at once greater and steeper than in the two great, previous periods of readjustment. We are being continually admonished to readjust our thinking to a new era. Maybe we should welcome deflation as the only true recovery measure and take lessons from our grandsires in how to make profits in a declining market.

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### *Research in the Universities*

Thomas H. Chilton of du Pont made a notable contribution to the recent Conference on Engineering Education in his suggestions for definite problems in chemical engineering which are particularly suited to study in the universities. His recommendations are certainly as timely as his title promised and so specifically practical that they are of real use to an alert teacher and quite disarming to the most critical operating executive. In concluding he repeated an old proposal that is quite familiar and was emphasized by his entire paper, yet which was, of necessity, overshadowed by the very excellence of his specific suggestions.

There is need indeed for coordination of all sorts of chemical and engineering research in our universities. A clearing house for the exchange of information on what is now under way would obviously be a wholesome preventative to some duplication, and much can, and we hope will, be done in this direction.

Thinking of both chemistry and engineering at once, more might result from greater specialization in the post graduate departments. If one institution were to emphasize plastics, another dyes, a third solvents—and today who specializes in heavy chemicals?—many benefits might result. If in each case a faculty was selected so that from the most abstruse problems of the pure chemistry involved to the most workaday problems of plant production, the general subject might be exhaustingly and authoritatively taught, reserves of research and supplies of man power, both of inestimable value, would be created. Support for such projects would be easier to enlist. Limitations of the narrow shop training given by our excellent textile, paper, laundry and other particularized schools would be overcome.

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### *At the Opening of the Contract Season*

The waning vacation season warns supplier and buyer that the contract period is fast approaching, and this September conditions fundamentally are quite different from those prevailing twelve months ago. Then we were sliding down hill at record speed: today the trend is upward. The psychological advantage (for all that it is actually worth in practice) has shifted from buyer to seller.

The steadily improving statistical position of the metals more than likely means rising prices for the copper salts, the tin derivatives, and the lead and zinc pigments. With business conditions better it is unlikely that carbon black producers will be satisfied to continue the current low quotations. Reprisal selling may be submerged sufficiently to bring the item back to a more profitable basis to the producers; but over-productive capacity is ever present, aggravated by the severe drop in the export trade, and the lethargy of domestic demand.

The trade generally expects naval stores to follow the commodities' trend over the next few months. Light purchasing of rosin and turpentine has been offset by the storage of the bulk of production under the protecting wing of the government loan plan, and an additional $3,000,000 granted recently is expected to provide adequate funds through September, at least. Many confidently believe that Chinawood oil is bound to mount to much higher levels once a more normal consumption is resumed and the difficulties of getting replacement stocks out of the Orient increase rather than diminish.

Several political influences may prompt the heavy chemical makers to adopt a *status quo* policy on prices for next year irrespective of factors that might otherwise have led them to revise upwards quotations on important items; but the pressure of higher raw material and labor costs combined with the heavier social security tax next year may prove irresistible.

# American Pioneer in Air Nitrogen

## *Frank Sherman Washburn*

DURING one of those brief spells of very hot weather that are so often visited upon New York during September, three loyal alumni of Cornell spent the week-end at Rye laboring for their *Alma Mater*. In order to clear away the preliminaries, Frank Washburn, as chairman of the fund-raising campaign in the Metropolitan area, had carried off to his country home (for Rye was then well out in the country) the two best workers on his committee.

After an early breakfast, they went right to work. It was the routine task of dividing up territories, selecting captains, assigning good workmen and men of special influence or acquaintance to the different teams, allotting the prospects, estimating how the pledges would measure up to the quota—just the fussy kind of detail work that quite literally gives one a headache. Lunch was sent into the library. Dinner was rather hurried for there was still much to be done.

It was past midnight when the chairman-host shoved back his chair and said; "Well, fellows, let's call it a day." Immediately, he jumped up.

"Come on," he exclaimed, "let's take a walk before turning in." He led the way, planning as he left the library that they return to the task at nine in the morning so as to finish in time for a swim before Sunday dinner.

They stepped out into the open. The night was still and clear, as soft and warm as a wool blanket; a respite, but no relief from the day's burning heat. They set off across the lawn at a brisk pace. After walking about a mile the chairman stopped short and turned around. "Now," he announced to his wilting committeemen, "let's run awhile."

After a driving day, "Now, let's run awhile"—that was Frank Washburn's way.

He was, as one of his long and close associates has said, "a man who was truly a glutton for work," and he indulged that inordinate appetite till it became almost a vice.

By profession Frank Washburn was a civil engineer, a capable, conscientious consultant with a flair for heavy construction work and a brilliant business imagination. By inclination he was an adventurous pioneer, a sort of twentieth century industrial Daniel Boone, always hunting, restless and alert along the outer fringes of the business frontier. By nature he was a reticent, rather introspective man who overcame a great natural shyness only in his middle years; but who in the heat of his enthusiasms became a driving master, a perfectionist demanding the utmost of himself and his men, impatient of delay, utterly intolerant of laziness and stupidity.

Through a strange series of haphazard coincidences he became interested in nitrogen and closely connected with important hydro-electric interests. From this curious combination the American Cyanamid Company naturally evolved. Looking backwards thirty years the clarity of his vision of the nitrogen future appears to

*Mr. and Mrs. Frank Washburn, with their daughter, Elizabeth, in the garden of their home, "Greywoods," in Nashville, Tenn., in 1916.*

have been almost a miracle of prophecy, and yet the sound logic of the business reasoning with which he planned to fulfil that future reveals a business leader of rare genius. Few, indeed, of our chemical pioneers have at once so boldly dreamed and so wisely done.

Frank Washburn was born in Centralia, Illinois, December 8, 1860. His father, Elmer Washburn, was an outspoken exponent of direct action, a shrewd, dictatorial individualist of straight New England ancestry, who had filled two important, contradictory posts in the Chicago stockyards. He was a past president of the National Livestock Bank and a retired head of the Stockyards Police Force. Such a dominating parent unintentionally suppressed a sensitive son, so that as the boy grew up, he naturally began to display an unwonted independence. Father and son attempted several partnerships together, but never succeeded in reaching a lasting agreement.

Frank Washburn was professionally trained at Cornell where he received the C. E. degree in 1883. He did a year's post-graduate work in economics, history, and politics and then went to work for the Chicago and Northwestern Railroad. He was quickly promoted to Engineer of Bridges, later to Engineer of Lines North of Chicago, and in 1889 was given the difficult assignment of reorganizing a subsidiary, the Chicago Belt Line Railway. Here he was brought into close contact with several important railway executives, and that same year the Illinois Central and the Lake Shore joined with his own road in sending him to England to study the methods and economics of British railway operation.

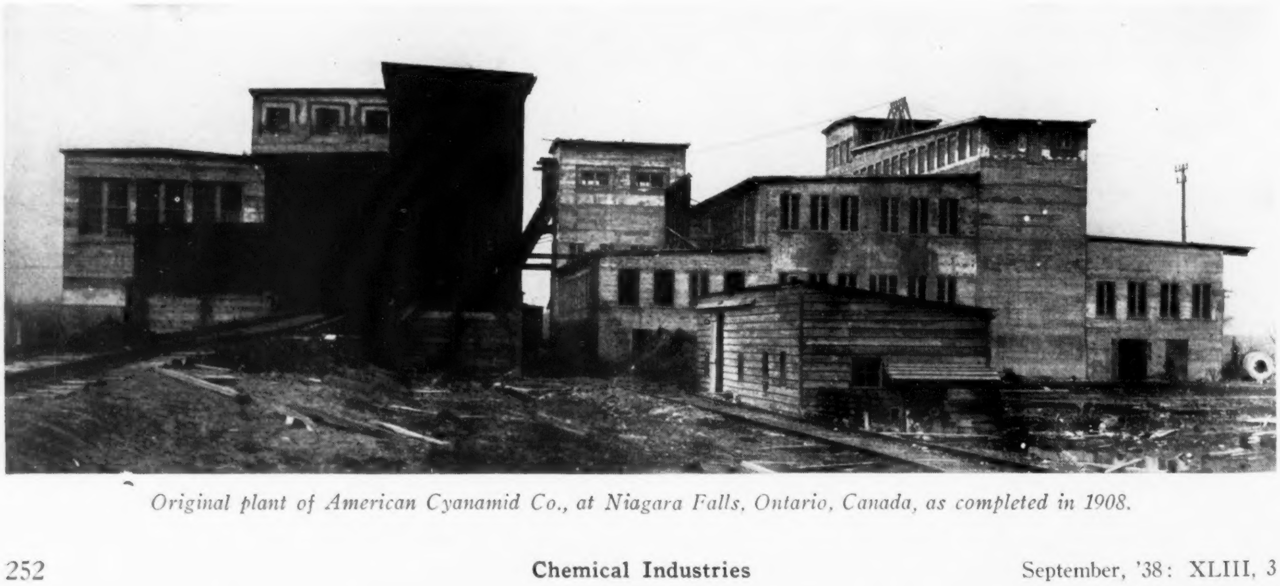
At this point the young engineer, but five years out of college, seemed plainly destined for a successful career in transportation. But upon his return he resigned and plunged into water works construction.

He went to work on Purdy's Dam, up to that time the biggest construction job in the New York water supply system, and afterwards he was placed in charge of building the two dams and reservoir at Carmel, N. Y. This work completed, he took over the construction of the Third Avenue Cable Railway in New York City.

Shortly before this last construction work was completed Mr. Washburn married Irene Russell of Augusta, Georgia, daughter of a prominent southern family whose sister was the wife of the President of Nashville, Chattanooga and St. Louis Railroad. While working on the cable line he met Colonel Grace, head of the great South American trading house. These two apparently quite unconnected events were the first links in the chain that led him eventually to air nitrogen.

Even as a very young man Frank Washburn inspired confidence and he was sent to Chile by the Grace interests to overhaul their nitrate operations. Though the field was new to his experience, nevertheless he was able very successfully to apply what he had learned building dams to the problems of large scale handling of the bulky caliche, while his cable railway lessons were more than useful in the transport of the refined saltpetre from the high, steep-sided plateau to the water's edge. He scored a conspicuous personal engineering triumph in Chile and was forthwith sent to Central America commissioned to review the surveys for the proposed Nicaraguan Canal and to report upon the economic soundness of the project. His findings—both technical and commercial—have been confirmed by History; but even at the time, his reports were so clearly stated and so logically buttressed with facts that he came back to the West Coast, after these experiences in the southern continent, with a well established reputation both as an engineer and a business analyst. He also brought back from South America a lively interest in nitrates, supported by first-hand information of the Chilean fields and of the far-flung, well-organized British and American interests which marketed this prime ingredient of both explosives and fertilizers.

His services were immediately sought as chief



*Original plant of American Cyanamid Co., at Niagara Falls, Ontario, Canada, as completed in 1908.*

engineer of the Bay Cities Water Co., which was building a new water supply system for San Francisco and a group of suburban towns. Here he engaged a young engineer, K. F. Cooper, who was henceforth to be closely associated with him in a number of enterprises. At this time too, he first came into contact with H. M. Goodman, and once the water works were completed, he joined with him to develop a line of mining machinery. He plunged into this work with all his accustomed vigor. Within two years the problems of design and production, which fascinated him, having been solved, he lost interest when the problems of merchandising became paramount.

His devoted wife, with a feminine dislike for the roving commissions that carried her engineer-husband all over the map and with a perfectly natural homesickness for her native Southland, undertook a delicate piece of engineering herself with the result that the family moved to Nashville and here Mr. Washburn became an associate of her nephew, Whitford Cole. This was in 1900, just at the time when young Cole,

*Photograph taken during construction of the Niagara Falls plant. Left to right, Major Berry, K. F. Cooper, F. S. Washburn, S. W. Mays, and G. A. Hendrie.*

having branched out from the family's original railway activities into coal and coke and blast furnaces, began to turn to the development of hydro-electric utilities. An informal alliance was made with Henry Parsons, an influential New Yorker with interests near Sheffield, Alabama, and Frank Washburn, the practical engineer of the group, was sent out to explore the potential power sites of the region. During this period he was largely responsible for the organization of the Birmingham, Montgomery and Gulf Power Company (incorporated December 8, 1900), the Little River Power Company, and finally the Alabama Power Company of which he was the first president.

Thus from the opening of the century to the outbreak of the hostilities in Europe, Frank Washburn was an outstanding leader in the development of hydro-electric utilities in the South. He visited every likely power site in the southern Appalachians. He examined into all the developed and undeveloped natural resources—timber, coal, limestone, bauxite, clays, mica, and what not—locating them and appraising each source of supply for its economic and geographic values. He made a painstaking study of the existing and potential industries of the entire region from the Blue Ridge to the Gulf of Mexico. His associates followed his recommendations almost implicitly so that he was the prime mover in the building, and later in the operation, of these important power developments.

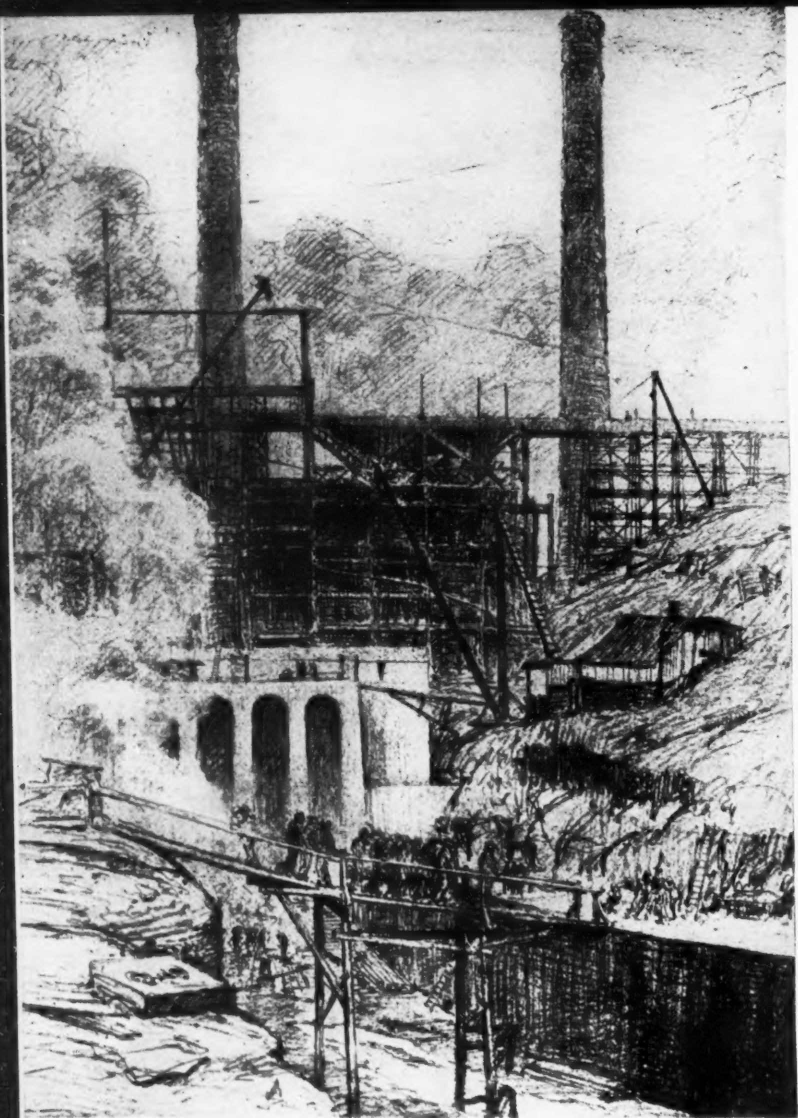
All his studies, backed by all his practical experiences, focused his attention upon the Muscle Shoals of the Tennessee River. Here, so he convinced himself, was the finest power site in the whole territory. This interest in Muscle Shoals was the final link that led him to air nitrogen.

*Mr. and Mrs. Washburn, with their children, Frank S., Jr., and Elizabeth, vacationing at Highlands, N. C.*

At Muscle Shoals the Tennessee drops nearly one hundred and fifty feet within thirty miles. Since at certain points the river sprawls almost to two miles width, these swift, shallow rapids are a serious obstruction to navigation. As far back as 1835 Alabama built a series of small canals along the edges of the shoals, and in 1870 the Federal Government took over and so improved the Muscle Shoals Canal that it became practical for small boats. It was, however, still insignificant as a means of river navigation in any sense competitive with rail transportation.

Realizing at once that while no plan to develop hydro-electric power at this location would be sanctioned that did not maintain the navigability of the stream, nevertheless any such elaborate project would double the costs of providing a sufficient, year-round head of water for a large electrical output, Mr. Washburn worked out a program whereby the Government would construct a larger canal; the Government and private capital would build jointly the necessary dams; the private interests would erect the power plant and transmission lines.

This proposal was heartily approved by the State of Alabama which had everything to gain. The Army Engineers sanctioned the plan as providing, at smallest expense to the Government, a maximum improvement in navigation on the most important river in the Southeast. Any hydro-electric plant at Muscle Shoals, if the



*The steam power plant of Nitrate Plant No. 2, Muscle Shoals, Ala., under construction.*

Tennessee were to be maintained as a navigable stream, would require an initial investment so heavy that Mr. Washburn estimated that the carrying charges at six per cent. would have represented eighty per cent. of the costs of the developed power. Accordingly, despite the favorable aspects of the river at this point, the rich natural resources of the region, and the potential power market in the Birmingham district, commercial development by private interests could only become feasible with some such cooperation with the Government in construction of canals and such dams as would preserve, even improve, the navigability of the stream.

Based upon this joint program the Muscle Shoals Hydro-Electric Power Company was organized and Representative Richardson of Alabama introduced a bill into Congress embodying this proposal. With the support of Alabama and the sanction of the Army Engineers, approval of this measure seemed certain, but the bill dragged through several sessions. Conservation of our natural resources, first urged by Theodore Roosevelt, was at this time a live political issue and President Taft had very plainly indicated that he wanted, not "a lot of mill dam legislation, but one national water power law." In the meantime, active water power development had been begun on a non-navigable stream, the Coosa River, where a $10,000,000 investment was made by the Alabama Power Company.

As long as the Muscle Shoals development was in prospect, it was plain that a big industrial consumer of a large block of primary power would be almost essential to the success of so large a project. Accordingly, Mr. Washburn began a search for such an initial customer. Since his Chilean days he had been interested in nitrates and he knew intimately the fertilizer situation in the United States. The proximity at once to the big fertilizer market of the South and to the Tennessee phosphate fields did not escape him. Accordingly, when he heard of the discovery by Birkeland and Eyde, of the arc process for nitrogen fixation, he promptly sailed for Europe to investigate it.

A power industry that produced fertilizer materials fitted perfectly into the logic of Mr. Washburn's plans. Therefore, after he had determined that, under American conditions, the arc process was not a sound commercial enterprise, he went from Norway to Germany to examine into the possibilities of another electrical method of fixing nitrogen that had been announced during his negotiations with Samuel Eyde. This was the Frank and Caro's cyanamid process.

Though consuming only a fourth as much electrical energy as the arc process, the production of cyanamid was essentially a power operation. Moreover, it required large quantities of coke and lime, both abundant in the Southern mountains. Mr. Washburn convinced himself that this process could be operated profitably in this country, so he purchased the American rights; and on July 22, 1907, the American Cyanamid Company was organized.

As there now seemed to be but little prospect of immediate development at Muscle Shoals, Mr. Washburn and his associates, W. R. Cole, his partner, William H. Lindsey, A. H. Robinson, a leading Nashville banker, and Charles H. Baker of New York, turned naturally to Niagara Falls. But carbide, aluminum, carborundum, and graphite were already big consumers taking up the base load of the American company. He therefore found it advantageous to negotiate with the Ontario Power Company whose new plant was just in operation on the Canadian side of the Falls. A twenty-five year contract for power at $10.50 per horse power year was finally signed. This rate was far cheaper than the lowest possible cost of their own power developed in the South.

Construction was immediately begun, and on December 4, 1909, the first carload shipment of three hundred bags, 52,240 pounds, left the plant. K. F. Cooper was works manager. S. W. Mays and P. F. Ronan were the plant foremen. The two former had been with Mr. Washburn on his own consulting engineering staff. Today Mr. Cooper is vice president of the American Cyanamid Company and Mr. Mays, the general pur-

chasing agent. Mr. Ronan is now superintendent of the Company's plant at Azusa, California.

The Niagara Falls operation expanded with amazing rapidity. The initial capacity in 1910 was 5,000 tons a year. By 1912 this had been increased to 12,000 tons; in 1913 to 25,000 tons; by 1915 to 50,000 tons.

Then came the War.

Long before we entered the conflict the nitrogen problem caused serious concern in Washington. Both for explosives and fertilizers we were obviously, even painfully, dependent upon Chile. The first chemical lesson of the World War had been that all General Staffs—not excluding the German—had grossly underestimated the explosive demands of modern warfare. At the same time we had discovered that the fertilizer demand for nitrogen grew quickly and became imperative in response to wartime needs for more foodstuffs raised, of necessity, on curtailed acreage with less farm labor. As early as 1915 the National Academy of Sciences appointed a distinguished committee to study the nitrogen problem. This committee, after investigating our probable nitrogen requirements, in event of war, visited Europe to explore the arc and cyanamid processes and to learn what they might about the Haber ammonia synthesis, for it was no secret that this process had saved Germany from nitrogen bankruptcy. In his reports for 1915 and 1916, General Crozier, Chief of Ordnance, had called particular attention to the nitrogen situation; and the Army and the Navy and the Department of Agriculture and the Interior, had all studied the problem. In May, 1916, Congress passed the National Defense Act which among other provisions appropriated $20,000,000 for the building of a nitrate plant or plants, the location of which and the process to be employed and the disposal of the surplus power or nitrates all being placed wholly in the hands of the President. It was under this National Defense Act that nitrate plant Number One to operate a modified Haber process worked out by the General Chemical Company and Number Two a cyanamid plant to be built by the American Cyanamid Company were constructed at Muscle Shoals.

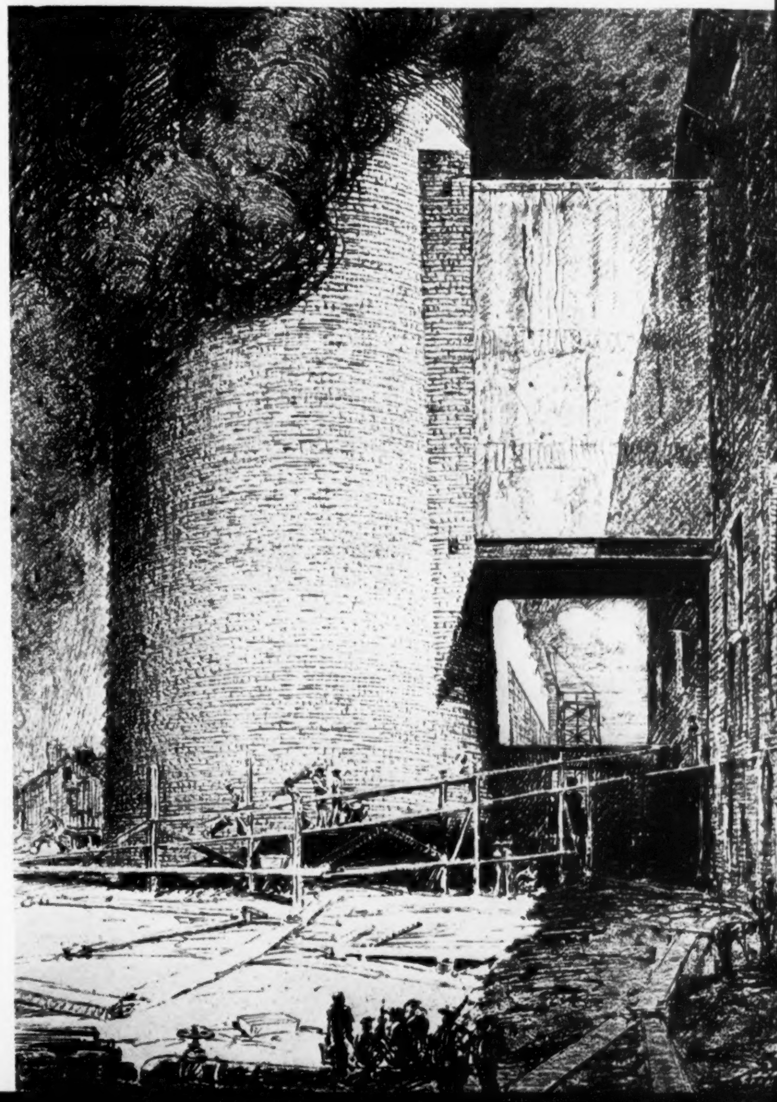
So much has been done at Muscle Shoals since October 29, 1918, when that cyanamid plant began operating its first trial run, and so much more has been said and written, that the importance of that war-time achievement has been completely obscured. It was, however, one of the greatest and most successful of all the great war triumphs of the American chemical industry. In Washington, November 6 to 8, 1917, Mr. Washburn, Dr. Walter S. Landis, the Cyanamid Company's chief technician, and K. F. Cooper, vice president, in conference with the Ordnance Department, drew up the rough specifications and raw material requirements for a 200,000 ton plant. Contracts were signed in December. Ground was broken in February. The foundation was laid in March. October 14, 1918, the liquid air plant was put in operation; October 21 the limekilns were fired; October 29, the carbide furnaces started.

Within a year, at a site out in the wilds, with no rail or road transportation to start with, amid extreme difficulties of getting both labor and materials, and under all the pressure of war conditions, the world's largest cyanamid plant was built with units for the production of both nitric acid and ammonium nitrate. Without these additional facilities, in a settled community with good transportation and during peace, the Company's best previous record had been a plant of one-seventh the cyanamid capacity put into operation in eleven months.

And the Muscle Shoals cyanamid plant operated successfully. The trial run performances of almost every unit of equipment surpassed rated capacities. The end product sought, ammonium nitrate, exceeded the government specifications in every respect save sulfate content which was .15 against .05 per cent. Considering the difficulties met and surmounted, it was an unparalleled feat of chemical plant design and construction.

Into that tremendous, patriotic effort, Frank Washburn threw all his great energies. He labored day and night, working literally fourteen to sixteen hours daily for weeks. He was justly proud of the results achieved, and the political hell-broth brewed after the

*The Stack Power Plant of Nitrate Plant No. 2, Muscle Shoals.*



Armistice at Muscle Shoals disgusted and saddened him. The unfounded accusations against his company and himself, the recriminations of conflicting interests, the political insincerities that developed, disillusioned him, but he never lost his faith in mankind. Nevertheless the injustice and ingratitude and duplicity of it all worried him and shortened his days.

In the meanwhile, the American Cyanamid Company—his company—had been firmly established. Already it had begun to diversify its products and so to widen its field of operations.

Back in 1910 they had started experimenting with the treatment of phosphate rock and the following year brought in Dr. Landis, then associate professor at Lehigh University, to investigate the production of phosphoric acid by new methods. Mr. Washburn sought shrewdly to add a line of phosphatic materials to the Company's nitrogen-bearing fertilizer. Both of these projects attracted James B. Duke whose tobacco interests had naturally brought fertilizers to his notice and who was already a substantial shareholder in the Virginia-Carolina Chemical Company. In 1914, when Mr. Washburn and Mr. Duke were both in Europe studying nitrogen fixation with the immediate object of bringing to America some cheap, practical method of producing nitric acid, they met in London, and Mr. Duke proposed an alliance of his phosphate rock and Mr. Washburn's cyanamid in the further development of Ammo-Phos. This new nitrogen-phosphorus fertilizer has been developed by Dr. Landis and successful pilot plant manufacture realized in 1912.

From this alliance grew the independent Ammophos Company, a plant at Warners, N. J., and a phosphate mine, acquired from the V-C subsidiary, the Amalgamated Phosphate Company, at Brewster, Florida. Before the new Warners plant was in production, the Cyanamid Company, by an exchange of stock with Mr. Duke and the Virginia-Carolina Chemical Company, took over Ammo-Phos completely, and in 1923 the V-C holdings which were sold to Mr. Washburn's old associates in Cyanamid.

Throughout his life, Frank Washburn followed the maxim of Theodore Roosevelt that it is better to wear out than to rust. In the end he broke down his overdriven body, but till his death the vital spark of his enthusiasm burned brightly. Had he lived another ten years it is likely that he would have explored some other new industrial field, for he was incorrigibly the pioneer. He was active in the development of twenty-four companies, with a majority of them since the very inception of the idea out of which these various enterprises grew. Eighteen of these companies became conspicuous successes. There were but two flat failures in his record.

Mr. Washburn once gave to his son a piece of advice which, based on his practical experience, summed up his philosophy of modern life. Having followed the father to Cornell and just back from active service in the Navy during the World War, the son was wrestling with the problems of a young man on the verge of his business career. He was attracted to the automobile industry, but his father said:

"It is too late. The automobile industry has grown up while you have been at school and college. Look at tomorrow, not today, when you pick your life work. Start with an industry in its infancy—airplanes or chemicals, if you will—it is only by growing up with a big industry that a young man in this country now can find a really big opportunity."

## *Industry's Bookshelf*

**Wood Preservation** by George M. Hunt and George A. Garratt, McGraw-Hill, N. Y. C., 457 pp., $5.00. Real contribution to the literature—a complete and satisfactory treatment of all branches of protection against insects, fungus, and other destructive agents.

**Aluminum** by Douglas B. Hobbs, Bruce Publishing Co., Milwaukee, 295 pp. A history, a metallurgical handbook, and a shop-guide covering the metal in all aspects and with many illustrations, tables and working designs.

**Chemical Analysis of Foods** by Henry Edward Cox, P. Blakiston's Son & Co., Phila., 329 pp., $5.00. Second edition of this practical work book which is a standard in England and has been well received here.

**The Analytical Chemistry of Tantalum and Niobium** by W. R. Schoeller, Nordemann Pub. Co., N. Y. C., 198 pp., $5.50. New methods based on original research embodying the use of tannin which has promise in the separation of earths and other inorganic analysis.

**Lectures on Osmosis** by F. A. H. Schreinemakers, Nordemann Pub. Co., N. Y. C., 122 pp., $7.00. Based upon exhaustive studies on the theoretical and practical aspects of osmosis made at the University of Leyden. The "last word" on this subject.

**Engineering Materials and Processes** by Wm. Howard Clapp and Donald Sherman Clark, International Textbook Co., Scranton, Pa., 543 pp. Metals and plastics discussed in informal text-book style with good lists of supplementary reading and a truly workable index.

**Catalytic Processes in Applied Chemistry** by T. P. Hilditch and C. C. Hall, Van Nostrand, N. Y. C., 478 pp. A new edition of what has enjoyed the well deserved reputation of being the most useful book for the chemical plant man on this subject, brought up-to-date.

**Electro-Plating** by Samuel Field and A. Dudley Weill, Sir Isaac Pitman & Sons, England, 372 pp., $4.00. One of those thoroughly good and pre-eminently practical handbooks of modern technical practice that are invaluable to direct workers and most useful for general reference.

# CREATING INDUSTRIES
# 1918—1938

## *A Series of Fifty Articles Reviewing the Progress of American Chemical Industry*

## Modified Plastics

***By Gustavus J. Esselen and Walter M. Scott***

One of New England's leading chemical consultants, and an internationally recognized authority on paper, textile, rayon, and plastics—the cellulose-using group of industries—Gustavus J. Esselen, Jr., received both his A.M. and Ph.D. degrees from Harvard University. After two years in the research laboratories of the General Electric Company and four years workaday business experience as manager of the Chemical Products Co., Dr. Esselen in 1918 entered consulting work associated with the late Dr. Arthur J. Little. In 1921 he became a partner in the firm of Skinner, Sherman and Esselen, and in 1930 he opened his own office at 857 Boylston St., Boston. Twice he has been named a delegate to the International Union of Chemistry.

Walter M. Scott, co-author, with Dr. Esselen, of the article on "Modified Plastics," is a member of the research staff of Gustavus J. Esselen, Inc. He received his Ph.D. from Yale in 1915 and started his career that year as chief chemist for Cheney Bros., silk manufacturers, where he stayed until '27; until '28 he was with National Aniline & Chemical Co.; from '28 to '30 with Munsell Color Co.; and from '30 to date has been consulting chemist for Gustavus J. Esselen, Inc. He is the author of numerous articles on applied chemistry, textiles and dyeing.

## Refrigerants

***By Crosby Field***

Four billion pounds of ice are manufactured each year by the unique method of freezing developed by Crosby Field as president of the Flakice Corp., and this operation is, moreover, finding application in the freezing of many other products. In fact, Mr. Field is one of the real pioneers in the modern development of artificial refrigeration. His fixed ideal as a chemical engineer is the continuous, automatic process, and he has paten.ed, among many other processes, methods for the use of mercury vapor for cooling, heating and temperature control at high temperatures; methods of lining and sealing kegs; several special refrigerants and processes for their production; also, production of steel wool, soap, etc. After graduation from New York University he won engineering degrees from Cornell and from Union, and after a brief period in the General Electric laboratories, he became associated with one of the first dyestuff companies which started in 1914. After active service as an officer in the Ordnance Dept., he became engineering manager of the National Aniline & Chemical Co. which had absorbed his old concern. For the past sixteen years he has been vice president of Brillo Mfg. Co., and president of Flakice Corp. since its organization.

***This Series of Articles will be Continued Each Month***

# Modified Plastics

## 1918—1938

### *By Gustavus J. Esselen and Walter M. Scott*

THE public has become plastic conscious within the last few years and many writers have made the statement that we are now entering upon an Age of Plastics. The impression has become quite general that plastics were almost unknown twenty years ago, and that any story of their commercial development would only need to cover a relatively short period. This opinion is substantially correct, if we consider only the so-called synthetic plastics which are built up almost entirely by a series of chemical reactions. However, it is far from being true for the types of plastics which form the subject of this review; namely, plastics derived from natural raw materials.

In 1917, well established industries in the United States, as well as in the principal countries of Europe, were engaged in the manufacture of plastic products from such commonly occurring raw materials as cellulose and casein: the cellulose being obtained principally from cotton, and the casein from milk. Rubber, shellac and bitumen were also being used at that time for plastic purposes. Improved modifications of these same natural materials have been made during the past twenty years, but no new natural plastic materials have acquired any great importance commercially. Some, however, have recently given indications of promise, notably the protein from corn or from the soy bean and the lignin from wood.

In spite of the tremendous increase in the production of plastic products from chemical raw materials, the natural sources of supply have more than held their own and the industries utilizing these natural raw materials are in a very favorable position at the present time. It is true that the earlier conversion product of cellulose (nitrocellulose) has been supplemented by newer conversion products, such as cellulose acetate and other esters and ethers of cellulose, and that crude rubber has been modified in several different ways to improve its plastic qualities. These changes have only served to increase the popularity of these natural materials for plastic purposes.

Bitumen or pitch holds the undoubted distinction of being the oldest known plastic. Students of our early civilizations have discovered that bitumen was used as a plastic many years before Christ in ancient Babylon. The modern application of bitumen dates back to the close of the 19th century when Bernard Weaver developed in England the product known as Ebonestos, a mixture of carefully blended pitches and bitumens with asbestos fiber and other fillers.

At the present time natural bitumens of high purity are obtained in the form of Gilsonite from North America and Cuba, and Rafaelite from Argentina. Bitumen plastics are commonly molded in compression molds at temperatures ranging from 260°-300° F., and a pressure of 2,000-6,000 lbs. per square inch. The products are marketed in only one color—black—and are suitable for electrical insulation and other electrical equipment.

Because of the low cost of the raw material—from 1c to 3c per pound—and its ease of handling in the molds, bitumen plastic is particularly suitable for large-sized molds and is quite generally used for the manufacture of battery boxes and parts. Its value for this purpose is enhanced by the fact that it is not affected by weak acids. No estimate is available of the amount of bitumen plastics produced in this country, but in the early part of the year 1937 it was estimated that the total output of bitumen plastics in England was about 6,000 tons per year, of which about 5,000 tons was used for batteries.

#### Hard Rubber

Although bitumen can lay claim to being the first natural raw material used for plastic purposes, its use in modern times has been somewhat limited. For this reason, hard rubber (quite generally known as Ebonite) is entitled to the claim of being the first of the widely used modern plastic materials. As early as the middle of the 19th century it was found that the demand for electrical insulation equipment could best be filled by rubber, and in 1854, O. Mayer in Germany laid the foundation of the use of vulcanized rubber as a molding material.

In 1910, the total world demand for raw rubber (other than for tires and tubes) was estimated at about 100,000,000 pounds. At that time but little reclaimed rubber was on the market. In 1934, the world used about 400,000,000 pounds of raw rubber and about 200,000,000 pounds of reclaimed rubber for manufactures other than tires and tubes. Data for the value

of hard rubber goods produced* in the United States has been tabulated since 1925. These figures are shown in Table I. Similar data for the amount of material used for this purpose are not available.

**Table I**

**Hard Rubber Goods**

Production in the United States[1]

| Year | Value (Thousands of Dollars) |
|---|---|
| 1925 | 29,111 |
| 1927 | 18,891 |
| 1929 | 17,937 |
| 1931 | 11,457 |
| 1933 | 9,927 |
| 1935 | 14,032 |

[1] Data furnished by United States Department of Commerce, Bureau of the Census.

Rubber has been superseded by the newer plastics for many purposes and although the demand for molded articles for electrical equipment and for other purposes has increased many fold, the amount of rubber used in this way has remained almost stationary.

In preparation for molding, rubber is compounded with sulfur and with various types of accelerators, anti-oxidants and fillers. Rubber plastics are molded usually in compression molds at temperatures and pressures as shown in Table II.

The hard rubber molding technique has remained virtually unchanged since 1909, and this lack of improvement in the rubber plastics industry is probably one reason why production has not increased appreciably. Another reason is the difficulty of compounding rubber, in comparison with most of the other plastics. Rubber plastics have been used for many years for the production of distributors and distributor heads, for the high tension ignition gear in internal combustion engines, for storage battery cases and for other electrical equipment.

Although rubber itself is not adapted to the production of molding powders, it can be modified by chemical reaction into forms which can be powdered and are more suitable for molding than raw rubber. The oldest of these derivatives is chlorinated rubber; the first patent for which was granted in England in 1859. However, commercial development is comparatively recent, having started in Germany about 10 to 15 years ago. Chlorine is introduced into the rubber molecule both by substitution and by addition. The trichloro derivative contains 61.4% chlorine and the tetrachloro derivative 68.5% chlorine, while the commercial product contains from 65 to 68% chlorine. Chlorinated rubber finds its largest use in varnishes and lacquers, but it can be molded in compression molds at temperatures and pressures as shown in Table II.

Plastics obtained from chlorinated rubber alone or in conjunction with fillers can be molded into machineable products. Chlorinated rubber is compatible with Bakelite in all proportions. Mixtures containing up to 50% of the rubber can be freed from solvent and powdered. Mixtures containing over 50% of the rubber can be disintegrated but not powdered.

Rubber is acted upon by halides of amphoteric metals, such as tin, to form true thermoplastic materials. Commercial development of these chlorostannic rubber derivatives has centered in the United States and dates back to about 1930. These derivatives are claimed to be highly resistant to acids, alkalies and moisture, to have excellent electrical properties, and to have less cold-flow than cellulose acetate. They are capable of being colored.

The development of chlorinated rubber has been followed by the development of oxidized rubber. Sulfonated rubber is also suitable for molding, and rubber hydrochloride has been used for the manufacture of transparent sheeting. Hydrogenated rubber, called "Hydrorubber," has been suggested for use in laminated glass and as an insulation for submarine cables.

## Shellac

Lac products, including shellac, are true thermoplastic materials and, although generally thought of in connection with protective coatings, they are used commercially in appreciable volume for molded plastics. The chief consumption is in the phonograph industry, where shellac is used both as a resin and as a varnish in the manufacture of records. It was estimated that

**Table II**

**Plastics Properties[1]**

| Type of plastic | Compression Molding: Temperature (° F.) | Compression Molding: Pressure (lbs. per sq. in.) | Injection Molding: Temperature (° F.) | Injection Molding: Pressure (lbs. per sq. in.) | Tensile strength (lbs. per sq. in.) | Water absorption (% in 24 hrs.) |
|---|---|---|---|---|---|---|
| Nitrocellulose | 185–250 | 2000–5000 | ....... | .......... | 5000–10000 | 1.0–3.0 |
| Cellulose acetate | 250–350 | 500–5000 | 300–440 | 3000–30000 | 3500–10000 | 1.4–2.8 |
| Casein | 200–225 | 2000–2500 | ....... | .......... | 7600 | 3.0–7.0 |
| Plioform[2] | 260–310 | 1000–3000 | ....... | .......... | 4000–5000 | 0.03 |
| Chlorinated rubber | 200–225 | 2000–5000 | ....... | .......... | ......... | 0.1–0.3 |
| Hard rubber | 285–350 | 1200–1800 | 180–220 | 2000–5000 | 4000–10000 | 0.02 |
| Ethyl cellulose | 212–300 | 1000–5000 | ....... | .......... | 2000-7000 | 1.25* |
| Furfural (wood flour filler) | 330–400 | 1000–3000 | 250–290 | 300–5000 | 5000–12000 | 0.2–0.6 |
| Lignin | 350 | 1500 | ....... | .......... | ......... | 0.6 |

[1] Data obtained from Modern Plastics, October, 1937.
[2] Industrial & Engineering Chemistry *26*, 128 (1934).
* Water absorption in 48 hrs.

in 1917 from 1/3 to 1/2 of the shellac imported into the United States was sold to phonograph manufacturers. The manufacture of phonograph records reached a peak in 1915-1917, and then due to the increased popularity of radio, dropped to a low in 1932. At the present time this industry is on the increase again and it is estimated that more than 30,000,000 records were sold during 1937, about 1/2 the volume of the 1917 peak, but about 7 times the volume of the 1932 low. The consumption of shellac has increased accordingly, although other resins are being used for this purpose.

Shellac plastics are finding increased use for molded insulators for electrical transmission lines, replacing porcelain for this purpose. Shellac insulators are not as fragile as porcelain and at the same time give just as satisfactory insulation.

Shellac is mixed with fillers such as slate dust or china clay and molded in compression molds at a temperature of 265°-270° F. and a pressure of 1,000-1,500 lbs. per square inch. It is usually produced in natural or black color, but bleached shellac can be used for any desired range of colors, even to pastel shades.

## Nitrocellulose

Nitrocellulose was truly the forerunner of the modern synthetic plastics industry. It results from the action of nitric acid on cotton cellulose, and under certain conditions can be used as an explosive, hence its early name of guncotton. To Alexander Parkes of England goes credit for the first discovery of the plastic qualities of nitrocellulose. In British patent 2,359, dated October 22, 1855, he describes the manufacture of sheets or other forms from a stiff, plastic compound of guncotton in a minimum of solvent. Later in British Patent 2,675, October 28, 1864, he disclosed the combination of nitrocellulose with camphor as a solvent and plasticizer, a combination which is in general use even today. Parkes called this plastic material Parkesine, but it was later more generally known as Pyroxylin.

Although the credit for the inauguration of this development goes to England, actual production of nitrocellulose plastics on a commercial scale was started first in the United States. In 1868 John W. Hyatt worked on this material in an effort to win a prize for the discovery of a substitute for ivory in the manufacture of billiard balls. His improvements in treating and molding pyroxylin were described in U. S. Patent 105,338, dated July 12, 1870, and he gave the name Celluloid to the finished product which has been continuously manufactured since that time. The manufacture of a similar product, called Xylonite, was started in England in 1877.

By 1913 the world output of nitrocellulose plastics was estimated to be about 65,000,000 lbs., of which approximately one-half was furnished by the United States. Estimates of the output in various countries for selected years from 1924 to 1935, inclusive, are shown in Table III, and the production of nitrocellulose plastic products in the United States is given in Table IV.

**Table III**

**Nitrocellulose Plastics**

Estimates of Output in Various Countries[1]
(Thousands of Pounds)

| | 1924 | 1932 | 1933 | 1935 |
|---|---|---|---|---|
| United States | 37,000 | 12,000 | 12,000 | 16,000 |
| Germany | 24,000 | 11,500 | 10,000 | 11,000[2] |
| France | 5,000 | 6,500 | * | 6,500[2] |
| England | 2,000 | * | 5,500 | 5,900 |
| Japan | 2,000 | 11,000 | 21,000 | * |
| Italy | 4,500 | 1,300 | * | * |
| Russia | * | 1,500 | * | * |
| World | 77,000 | * | * | 65,000 |

* No estimates available.
[1] Data obtained from Chemistry and Industry 57, 3-4 (1938).
[2] Estimates given in Modern Plastics, October, 1937, page 7.

**Table IV**

**Cellulose Plastic Products**[1]

Production in the United States
(Thousands of Pounds)

| | Nitrocellulose | | | | Cellulose Acetate |
|---|---|---|---|---|---|
| | Sheets | Rods | Tubes | Total | Total |
| 1927 | * | * | * | 16,298 | * |
| 1929 | * | * | * | 16,991 | * |
| 1931 | * | * | * | 12,008 | * |
| 1933 | 9,508 | 1,902 | 506 | 11,916 | 2,482 |
| 1934 | 9,772 | 1,771 | 818 | 12,361 | 4,826 |
| 1935 | 12,528 | 2,739 | 938 | 16,205 | 10,504 |
| 1936 | 13,220 | 2,786 | 929 | 16,935 | 13,036 |
| 1937 | 13,583 | 3,158 | 982 | 17,723 | 13,235 |

* Data not available.
[1] Data furnished by United States Department of Commerce, Bureau of the Census, Cellulose Plastic Products.

Till 1933 this country was the leading producer of nitrocellulose plastics, with Germany second. In 1933 Japan came to the front and although it is difficult to obtain reliable figures from that country, it is believed that she is at the present time the largest producer.

The production of nitrocellulose plastics in the United States was hit in 1930 by the depression and in 1932 by the introduction of cellulose acetate as a competitor. There was, however, a steady increase in the output since 1933, until in 1937 it surpassed the record of 1929.

It has been estimated (*Modern Plastics 15*, No. 2 30, 1937) that about 60,000,000 lbs. of nitrocellulose were produced (exclusive of explosives) in the United States in 1936, of which about 20% were used in plastics. The suitability of nitrocellulose for plastic purposes is governed by the extent to which the cellulose is nitrated, as expressed by its nitrogen content. For example, nitrocellulose containing 12.5%-13.2% nitrogen is used for explosives, 12% nitrogen for lacquers, and 11% nitrogen for plastics. For many years the chief source of cellulose for nitration pur-

poses has been cotton linters, but recently the cellulose from wood pulp has been improved sufficiently to make it suitable for nitration. The waste from regenerated cellulose has also been utilized to a limited extent.

Nitrocellulose plastics are molded in compression molds under the conditions of temperature and pressure noted in Table II. They are produced in all colors including black, and are used in the manufacture of fountain pens, tooth brushes and other types of brushes, toilet articles, eyeglass frames, imitation leathers, cutlery handles and all sorts of novelties. Nitrocellulose plastics are also extensively used in the manufacture of motion-picture and other photographic films. It was estimated in 1937 (*Industrial Marketing 22,* No. 11, 281) that approximately 2 billion linear feet of motion-picture film were manufactured and used annually. Furthermore, the U. S. Census of Manufactures is authority for the statement that in 1935 the value added by the manufacture of motion-picture and other films was $41,027,068. In recent years, the inflammable nitrocellulose films have been partially substituted by "safety film" made of cellulose acetate, but because of its lower cost nitrocellulose still enjoys a substantial portion of the business.

### Cellulose Acetate

Cellulose acetate plastics were introduced commercially in the United States in 1932. They can be manufactured in the same wide range of colors as the nitrocellulose products, and are used for similar purposes. In spite of higher cost, the output has steadily increased, as shown in Table IV, until in 1937 it reached 13,235,-000 lbs., only a little under nitrocellulose.

Advantages claimed for cellulose acetate plastics are:

1. Almost as clear as glass and will transmit 80 to 90% of the visible light in a sheet ⅛" thick.
2. Good light stability and remain practically unchanged in color after a year's exposure to sun and weather.
3. Transparent, translucent or opaque, and given any color desired.
4. Truly thermoplastic and readily shaped, formed or molded: scrap can be reformed and remolded.
5. Burn very slowly; less fire hazard than newspaper.
6. Strong and tough and withstand hard impacts without breaking or splintering.
7. High dielectric strength: well adapted for electrical insulation.
8. Retain a high polish, easily kept clean and are not spotted by grease, mineral oils, or fats.

Cellulose acetate plastics can be molded in compression molds under the conditions of temperature and pressure noted in Table II. However, their chief value lies in the fact that they are highly suitable for injection molding, which becomes increasingly popular because it speeds up production, though injection molding requires somewhat higher temperature and pressure than compression molding.

In addition to the various uses cited above for nitrocellulose, cellulose acetate is used for airplane windshields, eyepieces for gas masks, playing cards, handles for screw drivers or chisels, lamp shades and advertising signs. It is increasingly used in automobiles for knobs for the gear shift, cigar lighters, window regulators, cowl ventilators and horn buttons; also molded on a metal core for steering wheels. It is being adapted for use in bathroom fixtures and door handles.

Transparent sheets of cellulose acetate find widest application as the laminating material in safety glass. *Fortune* (Mar., 1936) estimated that 9,000,000 lbs. of acetate plastic was used in 1935 for this purpose alone. Other uses for acetate sheeting are for wrapping packages and for the lamination of wall papers. Approximately 5,000,000 lbs. of cellulose acetate went into thin, transparent sheeting in 1937.

### Benzyl Cellulose

Benzyl cellulose is an ether of cellulose suitable for the manufacture of molding powders. It was developed commercially in England several years ago, but has not been manufactured on a commercial scale in this country. For molding purposes it does not exhibit sufficient advantage over cellulose acetate to compensate for its present higher cost. However, it has achieved limited application in the field of transparent wrapping material because of its superior moistureproofness.

### Ethyl Cellulose

Ethyl cellulose plastics are being developed commercially in this country at the present time. They can be molded both in compression and injection molds. For molding purposes they require a temperature of 212-300° F. and a pressure of 1,000-5,000 lbs. per square inch.

Advantages claimed for ethyl cellulose plastics are:

1. Do not require a high molding temperature.
2. Compatible with wide range of plasticizers, resins, and lubricants and combine with plasticizers without aid of solvents.
3. Good electrical properties and because of low moisture absorption retain insulating characteristics under adverse conditions.
4. High shock resistance and retain their toughness and flexibility at lower temperatures than other cellulose derivatives.
5. Resistant to alkalies, mild acids, and heat.

A novel service is the marketing of ethyl cellulose "granules" prepared by the maker with plasticizers, lubricants, and colors, ready for molding and with guaranteed dimensional stability.

Cellulose aceto-butyrate is a mixed ester of cellulose manufactured commercially in the United States and is claimed to have some value as a molding material. However, at the present time it is chiefly used in the formulation of lacquers and other protective coatings.

### Cellulose Aceto-propionate

This is one of the latest additions to the mixed esters of cellulose. It has recently been introduced in the United States, and has been used in the manufacture of photographic films, particularly for X-ray purposes and, like the aceto-butyrate, is also recommended for use in lacquers and other protective coatings.

### Regenerated Cellulose

The regeneration of cellulose in the form of thin, transparent sheets by the extrusion into a coagulating medium of a solution of cellulose xanthate was established in the United States in 1926. The use of this transparent sheeting (commonly called Cellophane) as a wrapping material increased rapidly in popularity, and by 1932 the annual production in the United States reached a total of about 25,000,000 pounds. In 1937, approximately 75,000,000 pounds for wrapping purposes were manufactured from regenerated cellulose. Increase in production resulted in lower costs, with the result that the price in 1937 was less than 30% of the price in 1926. The value of regenerated cellulose sheeting for the wrapping of food and for many other purposes has been increased by giving it a special surface treatment to render it more impervious to moisture.

Japan has entered extensively into this manufacture, and in 1934, her annual production was estimated to be about 4,000,000 pounds. England and the other European countries have also followed suit as is indicated by the trade names for this product listed in Table VI. In Europe solutions of cellulose in a cuprammonium solution have also been used for the production of transparent wrapping material.

### Casein

Casein as a plastic material dates to 1897, when two Germans, W. Krische and A. Spitteler, working at first independently and then together upon the problem of waterproofing casein coatings, discovered the casein-formaldehyde reaction. A patent was granted in October, 1897, and attention was then given to the production of plastic casein in the form of masses, rather than as protective coatings. The process was soon acquired by the Galolith Company, and commercial development was started in Germany.

At first, all casein plastics were made by what is known as the wet process, but in 1909 an English company started production of solid plastic material from milk curds. Their studies resulted in the so-called dry process which was considerably more economical than the wet process, and consequently is now almost universally used. In the dry process, casein precipitated from skimmed milk by the action of rennet, is washed and pressed, then dried and ground. The dry, powdered casein is placed in a mixer and worked into a dough with a small amount of water, at the same time adding suitable dyes or pigments. The dough is extruded in rods, ribbons or tubes, or pressed into sheets, and the formed products are immersed in a 4 to 5% solution of formaldehyde until completely hardened. This may require from 10 days to 10 weeks.

Estimates of the output of casein plastics in various countries of the world for selected years from 1913-1935, inclusive, are given in Table V.

**Table V**
**Casein Plastics[1]**
Estimates of Output in Various Countries
(Thousands of Pounds)

| | 1913 | 1924 | 1930 | 1932 | 1935 |
|---|---|---|---|---|---|
| United States | * | * | * | 1,400 | * |
| Germany | 3,300 | 6,500 | * | * | 4,500 |
| Czechoslovakia | * | 4,500 | * | * | * |
| France | * | 4,500 | * | * | 7,700 |
| England | Approximately 3,700-4,500 per year | | | | |
| Japan | Approximately 1,500 (developing) | | | | |
| Italy | * | * | 700 | 550 | 1,300 |
| World | * | * | 22,000 | * | * |

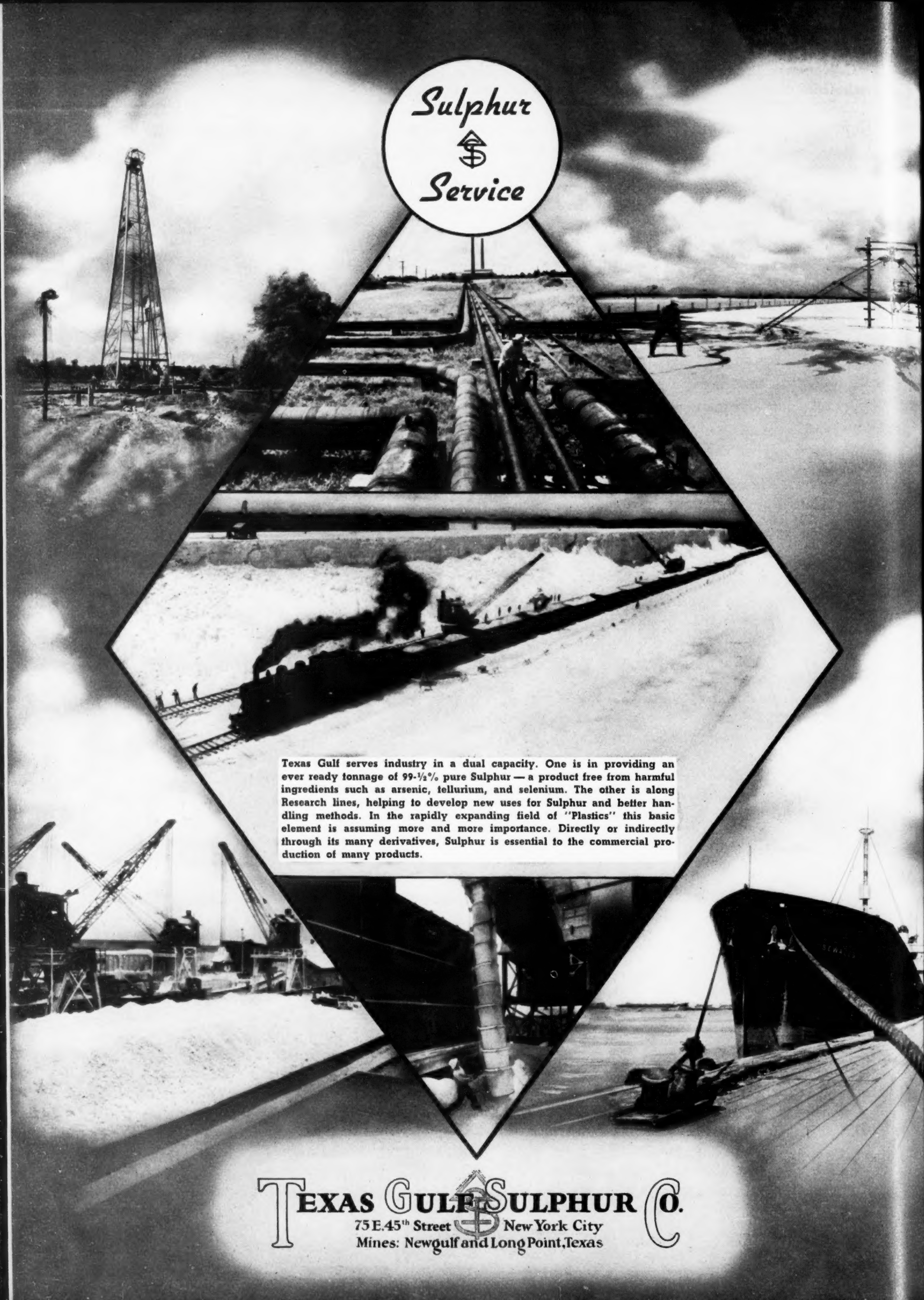
* No estimates available.
[1] Data obtained from Chemistry and Industry, 57, 3 (1938).

The total world output of casein plastics was estimated to be over 20 million pounds in 1930, and it is believed that approximately the same amount is produced at the present time. This country has not expanded in the casein field to the same extent as the European countries, but in 1932 our output was about 1½ million pounds, and it has maintained about the same volume since that time.

Casein plastic is not available as a molding powder because of difficulties in handling and in storage, and in the United States it is not produced in sheets thicker than ¼ inch, nor in rods larger than ⅝ inch diameter, because hardening and drying take too long. As shown in Table II, it is molded in compression molds at temperatures ranging from 200 to 225° F., and a pressure of 2,000 to 2,500 lbs. per square inch. Casein articles can be produced in a wide range of opaque or translucent plain colors and they can be sawed, ground, turned, carved and polished without difficulty.

Casein plastics have low resistance to moisture and they are somewhat brittle. Their use is confined chiefly to buckles, buttons, and accessory trimmings, although they are suitable for knitting needles, and have a limited application in electrical equipment and insulation. However, because casein articles are cheap and may be dyed after they are formed and polished, they will undoubtedly continue to maintain their present field.

Corn gluten contains 3 types of protein material: (1) carbohydrate-free protein, (2) carbohydrate-pro-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Mines: Newgulf and Long Point, Texas

tein insoluble in aqueous alcohol solutions, and (3), carbohydrate-protein material soluble in aqueous alcohol solutions. The third type, called zein, is chemically a prolamin and is the most suitable for use as a plastic.

Zein is a substantially white, odorless, tasteless amorphous solid, soluble in dilute alkalies, whose properties resemble those of shellac, casein, and cellulose esters. It is thermoplastic, has a high electrical insulation value, is resistant to heat and stable to light.

Attempts to utilize zein date back to before the World War, but commercial development as a plastic is still in its infancy and still confined to this country. It has been compounded with various resins, plasticizers, and fillers to form transparent, clear, stable products suitable for use in novelties, sizings and coatings. U. S. Patent 2,074,332, March 23, 1937, to D. W. Hansen, describes a transparent, flexible film made from zein which the inventor claims to be suitable for wrapping. Studies are in progress to determine the most suitable plasticizers for zein and the most satisfactory method of compounding for molding purposes.

### Soybean Protein

The protein material from soybeans is analogous in its properties to casein and to zein. Soybean meal, from which the oil has been extracted, can be used as the basis for plastic molding material. If plasticized with 5% or more of water it behaves in a similar manner to casein, but it is necessary to modify the casein procedure somewhat and the product is not as good. If the moisture content of the soybean protein is reduced below 5%, the plastic resembles zein rather than casein, but it is quite hygroscopic and somewhat brittle.

It appears that the best plastic material is obtained by removing all moisture and plasticizing the soybean protein with some anhydrous organic agent. Thus research is proceeding along the same lines as on zein; namely, to find a suitable plasticizer and a satisfactory method of compounding for molding purposes.

Plastics from soybean meal or protein have not yet been marketed on any large scale in this country. However, it has been stated (Science News Letter *33*, 302, 1938) that in 1937, 400,000 pounds of soybean meal were used in the manufacture of parts for motor cars, probably largely as filler.

### Lignin

Lignin has long been considered an undesirable impurity in wood which had to be removed in the process of preparing pure cellulose for the manufacture of paper or rayon. However, recent extended studies in the United States Forest Products Laboratory and elsewhere reveal that lignin has plastic qualities which adds it to the list of natural raw materials for the plastics industry.

Lignin was first converted into a plastic by condensing it with phenol and grinding the resultant product with 60 parts by weight of wood flour to 40 parts of the condensate. Subsequently, plastics were produced without the aid of phenol. Wood chips are hydrolyzed at a high temperature under careful control of temperature and time and moisture content. The wood is thus converted into a material which, when the water-soluble products are removed, can be molded to a homogeneous, amorphous plastic. The fibers remaining in the hydrolyzed product practically disappear during the process of curing.

Commercial production of this lignin plastic started in the United States in 1937. As shown in Table II it is molded in compression molds at a temperature of about 350° F. and a pressure of about 1,500 lbs. per square inch. Lignin plastics are limited in color to dark brown or black, but they may be turned, punched, tapped, sawed, drilled and polished. They have good dielectric qualities which can be improved still further by removing the normal moisture content before molding, and they have high moisture resistance.

In view of the low cost of the raw material which is available in large quantities in many sections of the country, this new addition to the plastics family appears to have a bright future.

### Furfural

Furfuraldehyde, known as furfural, is obtained commercially from oat hulls, one ton of hulls yielding approximately 200 lbs. of furfural. Because of its aldehydic nature, this product condenses with phenol to yield resinous products which set to rigid infusibility under heat and pressure. Furfural plastics are molded in either compression or injection molds, as noted in Table II, with a minimum of shrinkage so that the molded products reproduce with exact detail the contours, dimensions, and finish of the mold.

The advantages claimed for furfural-phenol plastics are:

1. Excellent resistance to moisture and acids as well as to high temperatures, being better in these respects than Bakelite.
2. Great mechanical strength and high dielectric properties.
3. Freedom from odor.
4. A rigid structure and, when properly cured, substantially no warpage even at a high temperature.
5. Compatibility with a wide range of modifying agents.

Furfural has been produced commercially in this country since 1920. Economically it is in a sound position. It is not limited to oat hulls as a source of supply, but may be obtained from corn cobs, rice hulls, peanut shells, cottonseed bran, and bagasse fibers and liquors. Furthermore, it has an advantage in combining weight, since 96 lbs. of furfural and 94 lbs. of phenol (a total of 190 lbs.) will theoretically combine to produce 172 lbs. of resin, while 190 lbs. of formaldehyde and phenol will produce only 115 lbs. of resin.

Furfural-phenol plastics are limited in color to dark brown or black. They are used chiefly for electrical equipment. Because of their high heat resistance they have found a special application in a heat-setting cement which is used in the incandescent lamp to hold the brass ferrule to the glass bulb.

### Sulfur

Native sulfur has thermoplastic properties and can be cast or molded in compression molds. It exhibits some shrinkage during solidification, which must be allowed for in designing molds. Sulfur is commonly compounded with carbon in the form of ground or colloided anthracite coal, graphite, or coke. It can be mixed with common organic fillers such as wood flour, or with inorganic fillers such as colloidal clay.

The advantages of sulfur plastics are their cheapness, low melting point, hardness, resistance to water and corrosive action, and their electrical insulating value. They have the disadvantage of brittleness in addition to their high coefficient of thermal expansion and contraction as noted above.

Sulfur reacts directly with phenol to produce resins which are capable of being molded and have some resemblance to Bakelite. Sulfur also reacts with aniline in the presence of a catalyst to form resins which can be molded and which have good insulating properties. Neither of these products are as yet being offered commercially.

### Miscellaneous

A molding resin has been made from the soluble tar of wood distillation by condensation with formaldehyde. Several types of plastics have been manufactured from sugar by condensation with formaldehyde and urea, formaldehyde and phthalic anhydride, phenols, or polyhydric alcohols. The formaldehyde-sugar condensates are colorless and transparent. Several of these products have been produced on a semi-commercial scale, but have not yet come into extended use.

### Conclusion

The plastic qualities of natural raw materials were recognized many years before Christ, and the modern commercial production of plastics by chemical reaction on products grown in Nature, dates back over fifty years. In spite of the present day competition from the so-called synthetic plastics such as the phenol-formaldehyde and urea-formaldehyde condensates and the vinyl and acrylate polymers, the future is still bright for the continued expansion of the esters and ethers of cellulose in the plastics field. Furthermore, the new developments from derivatives of rubber, corn, soybean and lignin indicate an ever-increasing production of plastics from natural raw materials.

A final picture of the present-day importance of plastics obtained from natural raw materials is given in Table VI, which lists the large number of trade names under which these plastics are sold in the various countries of the world. This branch of industry is not static and it has the decided economic advantage of cheap raw materials which are continually being renewed by Nature in great abundance.

**Table VI**

**Trade Names of Plastics from Natural Raw Materials**

| Raw Material | Country of Manufacture | Trade Names |
|---|---|---|
| Bitumen | General | Ebonestos |
| Rubber (Hard) | General | Ebonite, Stabalite |
| | U. S. | Ace-ite, Luzerne, Rubtex |
| Rubber (Chlorinated) | U. S. | Marbon, Tornesit |
| | Gt. Brit. | Alloprene, Duroprene |
| | Germany | Dartex, Pergut, Tegofan, Tornesit |
| | Italy | Duprenol |
| Rubber (Modified) | U. S. | Pliofilm, Plioform |
| Nitrocellulose | General | Celluloid, Pyroxylin |
| | U. S. | Amerith, Fiberloid, Kodaloid, Nixonoid, Parkhurst-Process, Pierretone, Pyralin, Viscoloid |
| | Gt. Brit. | Cellon, Exonite, Perloid, Xylonite |
| | Germany | Bellaphan, Cellubutol, Cellesta, Celtid, Drott, Elastozon, Histoloid, Suberit, Trolit F, Zellhorn |
| | Austria | Hyalin, Tocolit |
| | France | Sicoid |
| | Japan | Campholoid, Chissoloid |
| | Italy | Celluloide |
| | Norway | Trelit |
| Cellulose Acetate | U. S. | Charmour, Fibestos, Lumarith, Masuron, Moldacelle, Moldite, Nixonite, Plastacelle, Press Mass, Sundora, Tec, Tenite. (Wrapping) Kodapak, Protectoid |
| | Gt. Brit. | Acelloid, Acetaloid, Acetoid, Bennetate, Bexoid, Celastoid, Cellastine, Cebric, Cellomold, Christalux, Collcetone, Duroid, Marbloid, Utiloid, Vitreo-Colloid. (Wrapping) Acephane, Clarifoil |
| | Germany | Acetylon, Becrolit, Cellon, Ecarit, Lonarit, Lonzoid, Trolit W. (Wrapping) Neophan, Transparenta, Triphanfoil, Ultraphan |
| | France | Aceloid, Aceta, Acétoid, Acetol, Amzylolithe, Isoloid, Lugdomite, Nacrolaque, Rhodoid, Rhodopale, Similoid. (Wrapping) Acétophane, Rhodophane, Sécurite |
| | Japan | Acetyloid, Satolite |
| | Italy | Cellosit |
| | Switz. | Bernit, Cervinite |
| | Denmark | (Wrapping) Danofan |
| Cellulose Acetate-Butyrate | U. S. | Hercose C |

(Continued)

| Raw Material | Country of Manufacture | Trade Names |
|---|---|---|
| Acetate-Propionate | U. S. | Hercose AP |
| Benzyl Cellulose | Gt. Brit. | Benzex, Noveloid |
| | Germany | Trolit BC |
| | France | Mouldrite |
| Ethyl Cellulose | U. S. | Ethocel, Ethofoil |
| | Germany | (Wrapping) Isophan |
| Regenerated Cellulose | U. S. | Cellophane, Primophan, Sylphrap, Tee-pak |
| (Transparent wrapping) | Gt. Brit. | Celestafoil, Cetaphane, Crystex, Gnu-Wrap, Seracelle, Viscacelle, Vitrolux |
| | Germany | Cuprophan, Heliozell, Nalo, Transparit, Transphan, Zellglas, Zellwonet |
| | France | Innophane, Vitrocelle |
| | Japan | Cellushi |
| | Switz. | Cellux |
| | Belgium | Sidac |
| | Poland | Tomophan |
| Casein | U. S. | Aladdinite, Ameroid, Karolith, Kyloid |
| | Gt. Brit. | Autocrat, Defiance, Dorcasine, Ergolith, Erinoid, Galalith, Ikilith, Kasinoid, Keronyx, Lactoid, Lactorn, Moroid, Selenite. (Wrapping) Lactophane |
| | Germany | Alkalit, Beroliet, Bucholith, Ergolith, Esbrilith, Galalith, Hornit, Idealith, Lupinit, Neolith, Osalith, Syrolit |
| | France | Caseilithe, Cellulit, Gala, Ivogallith, Ivryne, Lactolithe, Luxolith, Rexalith, Sicalite, Porcellanite |
| | Italy | Corozite, Galakerite, Gallactite, Globerite, Zoolite |
| | Japan | Ambloid, Ambroid, Lactoloid |
| | Czech. | Argolit, Glorit |
| | Austria | Akalit, Hastra |
| | Belgium | Lactilith |
| | Holland | Casolith |
| | Mexico | E. C. A. |
| | Esthonia | Lactonite, Lactonith |
| | Russia | Moskalit |
| Corn Protein | U. S. | Maizite, Maizolith, Prolamine, Ronyx |
| Soybean | Japan | Satolite |
| Lignin | U. S. | Benalite |
| Furfural | U. S. | Durite |
| Sugar | U. S. | Sakaloid |
| | Germany | Zuckerith |

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# Lead Industry, 1937

The statistical record of the lead industry of the U. S. for '37 indicates major improvement over '36, according to the U. S. Bureau of Mines. Production of refined lead from domestic ores increased 14 per cent.; apparent consumption of primary lead, not considering changes in producers' and consumers' stocks, rose 18 per cent.; the average annual price at New York was advanced from 4.71 cents per pound to 6.01 cents; and stocks of refined and antimonial lead declined from about 172,000 tons at the beginning of the year to less than 130,000 tons at the end. Most of the gains for '37, however, were made during the early part of the year and much of the advance made in this period was wiped out by the sharp decline in the closing months.

The output of refined primary lead from domestic ore in the U. S. in '37 amounted to 443,142 short tons valued at $52,291,000, according to the Bureau of Mines, compared with 387,698 tons valued at $35,668,000 in '36, increases of 14 per cent. in quantity and of 47 per cent. in value. The production of refined lead from foreign sources amounted to 24,175 tons, compared with 11,458 tons in '36. The total output of primary lead from domestic and foreign sources was thus 467,317 tons in '37, an increase of 17 per cent. over the output of 399,156 tons in '36.

### U. S. Production

The principal sources of production in the U. S. were as formerly, Missouri, Utah, and Idaho. Of the foreign total, 5,343 tons were from Canadian ore, 3,836 tons from Mexico, 8,497 tons from South America, and 388 tons from Europe. 782 tons were from Mexican bullion.

The quantity of refined primary lead available for consumption in the U. S. in '37 amounted to 452,129 tons, compared with 383,432 tons in '36, an increase of 18 per cent.

Antimonial lead produced at primary smelters totaled 27,524 short tons, containing 7,833 tons of primary domestic lead, 1,721 tons of primary foreign lead, 1,726 tons of primary domestic and foreign antimony, 15,391 tons of secondary lead, and 853 tons of secondary antimony.

# Refrigerants

## 1918—1938

### *By Crosby Field*

THE aspects of refrigeration of chief interest to the chemical field are those which involve industrial processes, such as the manufacture of film, rayon and the compressed gases. Here twenty years have seen much progress. New techniques and broadening markets have likewise been the rule in the application of refrigeration to foods and other perishables. A third broad classification needs also to be considered in this survey; air conditioning, as applied to comfort, a practice virtually new within this period, and one having much influence on all phases of refrigeration. A fourth possible classification, the manufacture of the small mechanical refrigerator, may be noticed here briefly, at least, with respect to its influence on the others.

Another classification might consider refrigeration as a producer, against refrigeration as a consumer. So regarded, our industry sells cooling and freezing equipment, ice, cooling services and the like, while it buys considerable amounts of salts, ammonia and other chemicals. Or again, it may be illuminating to classify the field according to temperature, ranging from a high in comfort cooling of perhaps as much as 80° or 90° F. to a low of —297° F. in the manufacture of liquid oxygen, a common article of trade. Lower temperatures are encountered in the manufacture of hydrogen and the rare gases. In the dry ice business we have temperatures below —100° F., while in oil refining the common level is now about —80° F. Refrigeration parlance recognizes two common ranges in handling perishables—freezer temperatures of —26° F. to +5° F. and storage temperatures of +20° F. to +40° F.

Refrigeration, the controlled removal of heat, finds its chief industrial application in what may be broadly termed chemical control. The thermal processes are chiefly evaporation, condensation and compression (or absorption). Processes such as the liquefaction of oxygen or helium require low temperatures as a fundamental element in production, although they do not carry out the evaporative leg of the cycle, while certain high-temperature processes involve evaporation but not condensation. It is thus difficult to define the field, exactly, but the divisions of leading interest are those five indicated in Table I, in which the production of ice is also shown for comparison. No exact comparable data are available to indicate the extent of use of refrigeration on any basis, but the production of these five industries where refrigeration plays an important part indicates the increase during twenty years. Probably this increase understates the increase in use of refrigeration in these processes.

Rayon was reported manufactured in 29 establishments in 1930, using an average of 6,000 h.p. each, a considerable share of which was required for refrigeration. Extraction and handling of cellulose require various low temperatures and atmospheric conditioning is common. The capacity installed in this work is estimated at 10,000 tons.

Those gases or liquids produced from processes involving low temperatures include helium, hydrogen, oxygen, neon, argon, fluorine, nitrous oxide and chlorine, as well as liquid carbon dioxide which is closely related to "dry ice," now a substantial branch of our field. In 1933 about 30,000 tons of the solid were manufactured in 30 or more plants. Production has increased since that date, and the market is broadening. In this group belongs the manufacture of the refrigerants used by our industry, of which the leaders are ammonia, Freon (dichlorodifluoromethane), methyl chloride, and sulfur dioxide. This group composes one of the chief branches of refrigeration, though it cannot be put on an accurately comparable basis, even if detailed data were at hand. The increased activity of the past two decades in aviation, welding, bottled beverages and others has indirectly provided the stimulus for progress in this branch of our industry.

Another large but vaguely defined area is nitrogen fixation where refrigeration enters the final stage as an instrument in the synthetic ammonia condensation. While this process might be carried on at higher temperatures, it is economical to carry it out at 0° F. or lower, to increase the return of ammonia from the mixture of N and H, and reduce the amount of gas returned to the converter. Refrigeration is likewise often concerned with the production of hydrogen or nitrogen, or both. Twenty years cover nearly the whole history of this industry.

Petroleum refineries use more refrigeration as the processes become more carefully controlled and the products more numerous. Some 400 refineries in the United States use on the average about 2,000 h.p. each, a portion of which goes for refrigeration at about 0° F. and a part at a considerably lower temperature. This is largely done with ammonia compressors and a plant

handling 100 bbl. per hour will need a refrigerating system of 200 to 400 tons capacity. An increasing application is the cold processes of producing anti-knock gasoline, while refrigeration has long had application in recovery of casing head gasoline, in shale oil refining, and in removal of hydrates from natural gas pipes lines. Newer processes in lubricating oil are constantly appearing. Dewaxing with propane or other solvents at temperatures running down to —80° F. is now the rule and in newer plants at a level of —150° F. Such a temperature requires special refrigerants, themselves hydrocarbons. The ammonia absorption or compression machine has otherwise been used.

The fifth index of Table I is a crude indication of a large increase in refrigeration in the making of film and in development processes, requiring on the order of 20,000 tons capacity, countrywide, mostly at a temperature of 0° F.

### Table I

**REFRIGERATION IN INDUSTRY: GROWTH OF FIELDS OF DIRECT APPLICATION**

**(Value of products in thousands of dollars, in principal fields using refrigeration in processing, from U. S. Census of Manufactures)**

| *Field* | 1914 | 1925 | 1929 | 1935 |
|---|---|---|---|---|
| Rayon | ...... | 88,060 | 149,546 | 185,160 |
| Compressed gases | 10,415 | 55,532 | 71,293 | 67,147 |
| Nitrogen and fixed nitrogen compounds[1] | 5,350 | 29,659 | 38,337 | ...... |
| Petroleum refining | 396,361 | 2,376,657 | 2,639,665 | 1,838,621[2] |
| Photographic equip. | 39,041 | 78,654 | 102,827 | 73,966 |
| Ice | 60,386 | 186,969 | 210,950 | 128,385 |

[1] See p. 651, vol. II, 1930 Census of Manufactures; nitrous oxide included with this group as well as group 2.
[2] For 1934.

### Table II

**FIELDS FOR INDUSTRIAL AIR CONDITIONING**

| *Industry* | *Number of Plants,* 1935 |
|---|---|
| Baking powder manufacture | 46 |
| Blast furnaces | 72 |
| Breweries | 666 |
| Cable winding | .. |
| Candy manufacture | 1,314 |
| Chewing gum plants | 26 |
| Chocolate plants | 44 |
| Developing, photographic | .. |
| Drug manufacturing | 1,056 |
| Felt goods manufacture | 40 |
| Enameled ware | 698 |
| Explosives | 74 |
| Flavoring extracts | 407 |
| Fur storage | .. |
| Linoleum plants | 4 |
| Macaroni manufacture | 336 |
| Match manufacture | 24 |
| Moving picture studios | .. |
| Mushroom culture | .. |
| Printing plants | 19,840 |
| Rayon and textiles | 447 |
| Tobacco and cigar factories | 890 |

Among other industrial applications the following may be noticed: wool cleaning, the manufacture of glue and of aniline dyes. Application to various other chemical processes may be noted, such as sodium sulfate and potassium chlorate. In the manufacture of ammonium nitrate, refrigeration is used in the form of air conditioning to effect partial crystallization and recovery of alcohol. Refrigeration in the form of ice is used in the manufacture of coal-tar intermediates, particularly where water is wanted for taking up free sulfuric acid during nitration by means of mixed acid, without rise of temperature in the end product. Substantial application has been made of freezing for sinking shafts and building tunnels in sandy soils, while ice for skating and curling rinks may be mentioned.

Table II indicates another classification of industrial applications. Here we have those applications where the cooling is used to effect a desired atmospheric condition, important to certain processes. This brings the number of kinds of industrial applications of refrigeration, including air conditioning, to about forty.

Table III indicates the refrigerated foods classified

### Table III

**CHIEF ARTICLES OF FOOD EMPLOYING REFRIGERATION**

**(Annual production, consumption or plant output from "Survey of Current Business" and "Agricultural Yearbook"[1])**

| | 1919 or 1920 | 1924 or 1925 | 1929 | 1934 or 1935 |
|---|---|---|---|---|
| Apples, thous. of bu., p. | 140,786 | 151,752 | 133,318 | 167,283 |
| Asparagus, thous. of crates, p. | ...... | 2,526 | 3,885 | 5,406 |
| Bananas, thous. of bunches, c. | 36,848 | 50,513 | 65,909 | 51,987 |
| Beef and veal, millions of lbs., c. | 5,180 | 5,538 | 4,848 | 5,275 |
| Beer, thous. of bbls., p. | 9,231 | ...... | ...... | 45,060 |
| Butter, thous. of lbs., p. | 815,472 | 1,376,304 | 1,557,996 | 1,661,448 |
| Cabbage, thous. of tons, p. | 443 | 554 | 686 | 1,213 |
| Cantaloups, thous. of crates | 11,159 | 14,533 | 15,521 | 11,815 |
| Cheese, thous. of lbs., c. | 375,660 | 487,632 | 460,260 | 671,364 |
| Chocolate and cocoa, thous. of lbs., p. | ...... | 484 | 544 | 735 |
| Eggs, thous. of cases,[2] p. | 14,688 | 15,540 | 15,708 | 13,368 |
| Grapes, millions of lbs., p. | 2,516 | ...... | 3,883 | 4,574 |
| Grapefruit, thous. of boxes, p. | 3,656 | ...... | 8,722 | 19,495 |
| Lamb and mutton, millions of lbs., c. | 470 | 470 | 550 | 702 |
| Lemons, thous. of boxes, p. | 6,585 | ...... | 9,338 | 7,500 |
| Oranges, thous. of boxes, p. | 27,833 | 31,607 | 33,731 | 52,213 |
| Peaches, thous. of bu., p. | 50,680 | ...... | 42,827 | 54,690 |
| Pears, thous. of bu., p. | 14,304 | ...... | 18,500 | 25,299 |
| Pork and lard, millions of lbs., c. | 4,603 | 6,296 | 7,299 | 6,604 |
| Potatoes, sweet, thous. of bu., p. | 78,092 | ...... | 65,193 | 83,128 |
| Poultry, thous. of lbs.[2] | 218,868 | 370,796 | 389,521 | 305,952 |
| Strawberries, millions of qts. | 177 | ...... | 331 | 253 |
| Sugar, tons, p. | 1,326 | 1,043 | 1,217 | 1,546 |

[1] The following items are omitted from the table: Apricots, cherries, nuts, prunes, raspberries, etc., dairy products, fish and retail frozen foods.
[2] Receipts at principal markets. p = produced. c = consumed.

on an industrial basis, showing changes in gross production the last few years. Indication of increased use of refrigeration is supplied by what data we have for refrigerated warehouse space, and the movement of freight cars of perishable produce. These are approximately indicated by Tables IV and V. An increasing demand for refrigeration goes forward with an increasing technical perfection in methods of applying it. The subject may be divided as to the state of the product, whether (a) unfrozen, (b) frozen, (c) sharp frozen, or (d) quick frozen.

The bulk of refrigerated perishables is in the unfrozen state, of which the largest single classification in most warehouses is for apples and pears. In refrigerated cars, fruits and vegetables lead, with fresh meats second, and citrus fruits third. Eggs, like apples, must be stored to level out production and demand. Long periods of storage are now possible and successful.

The principal frozen products are ice cream and poultry. Approximately half of all poultry is frozen today, as is a large part of our fish.

One of the oldest applications is to meat, where refrigeration is used in virtually all departments of beef, pork and lamb production. Initial chilling of the animal carcass is vital. Throughout the handling of meat, temperatures above the incipient freezing temperature of 31° F. are limited by shrinkage, spoilage mold and bacteria, and loss of color. Ice is the invariable method of keeping unfrozen fish and is used extensively. Frozen fish is one of the chief items of the cold storage trade, in amounts indicated in Table VII. Unfrozen vegetables are iced as soon as possible after pulling. It has been found, for example, that spinach sent by truck to market in the ordinary way, will have its Vitamin C content reduced to nil, whereas if iced or frozen immediately upon pulling will have from 70 to 100 per cent. of its original Vitamin C content at the time the customer purchases it.

In bakeries, proper consistency of dough for various purposes is obtained by the use of ice water. Air cooling has also a vital place here. In our cities pure, fresh milk would be impossible without modern refrigeration. The most approved method is to chill the milk as soon as possible to below 40° F., by means of brine or other refrigeration system, and to maintain this temperature constantly, excepting for pasteurization, until it reaches the customer. Considering ice cream as a separate industry, Table VIII is interesting. To prevent chocolate from becoming gray and to keep milk or other ingredients containing fatty acid from becoming rancid, refrigeration is used in the chocolate and bonbon industry, as well as in the starch rooms. Hard candies require refrigeration to fix the surface, as also in the manufacture of chewing gum.

There are three ordinary methods of freezing foods. In the first, which is a slow process, the food is subjected to freezing over a period of time, such as 24 hours or more. This has been improved, giving a better product by freezing in some 6 to 10 hours, or *sharp* freezing in less than 2 hours. Quick freezing pre-

### Table IV

**REFRIGERATED STORAGE**

**(In thousands of pounds, maximum holdings during year, from monthly reports to Bureau of Agricultural Economics)**

| | 1916-1920 | 1923 | 1929 | 1935 |
|---|---|---|---|---|
| Butter | 112,059 | 102,731 | 168,952 | 156,855 |
| Cheese | 68,210 | 63,960 | 106,009 | 114,953 |
| Fresh eggs[1] | 6,849 | 10,222 | 8,962 | 7,947 |
| Frozen eggs | 16,751 | 43,836 | 91,488 | 112,585 |
| Frozen poultry | 78,941 | 121,632 | 115,876 | 132,001 |
| Beef | 275,265 | 114,113 | 98,913 | 140,940 |
| Pork | 849,846 | 940,071 | 944,742 | 687,563 |
| Lard | 120,532 | 143,579 | 203,010 | 118,107 |

[1] In thousands of cases.

### Table V

**COLD STORAGE SPACE IN UNITED STATES**

**(From monthly reports to Bureau of Agricultural Economics)**

| Year | 1927 | 1929 | 1933 | 1937 |
|---|---|---|---|---|
| | | *Number of firms* | | |
| Public | 462 | 517 | 540 | 636 |
| Private | 273 | 270 | 225 | 237 |
| Public-private | 219 | 209 | 175 | 178 |
| Meat packing | 378 | 375 | 334 | 309 |
| Packing-cold stg. | 31 | 29 | 25 | 14 |
| | 1,363 | 1,400 | 1,299 | 1,374 |
| | | *Space, millions of cubic feet* | | |
| Public | 273.9 | 316.8 | 317.3 | 333.8 |
| Private | 24.8 | 29.1 | 32.7 | 33.9 |
| Public-private | 57.3 | 60.3 | 64.7 | 52.9 |
| Meat Packing | 245.5 | 266.3 | 253.8 | 278.3 |
| Packing-cold stg. | 66.3 | 56.1 | 43.4 | 31.4 |
| | 667.8 | 728.6 | 711.9 | 730.3 |

### Table VI

**MOVEMENT OF PERISHABLES IN REFRIGERATOR CARS**

**(Thousands of tons shipped by rail, Interstate Commerce Commission)**

| Year | 1921 | 1925 | 1929 | 1935 |
|---|---|---|---|---|
| Citrus fruits | 1,508 | 1,363 | 2,355 | 2,017 |
| Fresh fruits (except citrus) | 4,681 | 5,910 | 5,690 | 3,683 |
| Fresh vegetables (except potatoes) | 1,888 | 2,828 | 3,222 | 2,464 |
| Fresh meats | 2,577 | 2,904 | 3,008 | 2,582 |
| Poultry | 276 | 357 | 417 | 284 |
| Eggs | 550 | 591 | 588 | 322 |
| Meat products | 2,094 | 2,139 | 2,774 | 1,081 |

### Table VII

**STORAGE OF FROZEN FISH**

**(Thousands of pounds, Bureau of Fisheries)**

| Year | 1920 | 1929 | 1933 | 1937 |
|---|---|---|---|---|
| Total U. S. production of frozen fish | 92,260 | 139,297 | 95,874 | 168,224 |
| Maximum monthly storage in year | 72,318 | 79,439 | 58,338 | 87,576 |

vents changes in the cellular structure of the food, either by piercing cell tissue by large ice crystals or by differences in salt concentration due to slow freezing, or both.

Refrigeration is used in controlling growth by temperature of beer yeast, and indirectly in the form of air conditioning in the production of mushrooms. In reverse, refrigeration prevents the growth of moth eggs and larvae in storage of furs.

### Technical Progress Affecting Economy

The gross economic change of twenty years is marked by an increase of wage earners from about 50,000 to more than 90,000, from 1919 to 1937, and an increase in value of products from about $400,000,000 to more than $600,000,000. This refers to all manufacturing activity, including the manufacture of refrigerating machinery of all sorts, and its chief industrial uses, such as ice, cold storage, ice cream and the like.

The machinery of refrigeration has shown perhaps the most conspicuous changes in greater capacity and lighter construction, with extended use of automatic controls. Compressors have more cylinders, lighter valves, and higher speeds. The influence of the small refrigerating machine has affected all practice. This period has seen the introduction of centrifugal compressors and some other new types. The absorption machine in large sizes has become less common, however, though successfully applied in the three-fluid system embodied in one well known household refrigerator. The invention of this system is one of the few discoveries of this period that can be called basic.

Radical developments have appeared in evaporative systems, where the refrigerating engineer has found that the laws governing heat transfer, as developed by chemical engineers, apply to his work as well. By proper selection, evaporating systems are now running at over 100 Btu. per hr. per sq. ft. per ° F., where 15 or thereabouts was the rule in 1918. Evaporating systems operate under flooded conditions with float valves instead of expansion valves, formerly the rule. Other automatic feeding systems are in general use.

Another broad area of progress has been air humidification and dehumidification, the typical application being in the cold storage industry, where certain products, such as eggs, called for special studies. The use of ozone has become of importance in egg storage, and now in meats and other products. Another development of promise is the British practice of storing commodities in controlled amounts of carbon dioxide. Many advantages in the way of increased storage life and economy are claimed.

Air conditioning proper, principally in comfort cooling, has influenced the perishable industry, in one way or another, and brought into the area of controlled atmosphere, new commodities such as bananas and sweet potatoes which do not store successfully at the usual cooler temperatures. As suggested by Table II, each special application of conditioning in process work has called forth many special researches. Investigations of one application often help solve the problems of another.

Transportation of unfrozen meat in refrigerator cars is carried out with small proportions of salt. To a small extent, dry ice has been used in combination with water ice. Mechanically refrigerated cars, although successful from a technical viewpoint, have been retarded because of economic factors. The transportation of frozen meat or other products is accomplished by ice and salt, where it is endeavored to maintain the car at temperatures lower than 10° F. Frozen eutectic salt brines, melting at —6° F. have also been used successfully. (See Table VI).

The small machine has brought in not only automatic controls, but also new refrigerants. Of special importance here is the gas, dichlorodifluoromethane or Freon, developed as a non-toxic refrigerant for the household refrigerator. Sulfur dioxide and methyl chloride still find extensive application as household machine refrigerants, but Freon has wide application in air conditioning, being largely responsible for the practical small air conditioning systems and small units such as room

**Table VIII**

**MILK AND ICE CREAM INDUSTRY DATA**
**(Milk data from "Survey of Current Business"; Ice cream data from Bureau of Agricultural Economics)**

| Year | 1919 | 1929 | 1933 | 1935 |
|---|---|---|---|---|
| Fluid milk, thous. of qts.: | | | | |
| Received in New York .. | ..... | 121,566[1] | 110,139 | 106,546 |
| Received in Boston ...... | 13,059 | 18,446 | 18,179 | 17,460 |
| Milk products, thous. of lbs. (U. S.): | | | | |
| Powdered .............. | 3,666 | 18,407 | 25,095 | 26,412 |
| Evaporated ............ | 96,904 | 124,970 | 143,058 | 153,241 |
| Condensed, case ........ | 47,957 | 12,296 | 4,595 | 4,568 |
| Condensed, bulk ........ | 8,225 | 21,180 | 12,992 | 14,194 |
| Ice cream, thous. of gals. .. | ..... | 267,274 | 148,900 | 199,380 |

[1] 1930.

**Table IX**

**SALES OF ELECTRIC AND ICE REFRIGERATORS**
**(With comparable data on other products, by number and value in thousands of dollars; U. S. Census of Manufactures)**

| Year | 1921 | 1929 | 1931 | 1935 | 1937 |
|---|---|---|---|---|---|
| Radios, phonographs, value .......... | ...... | ...... | 193,143 | 200,913 | ...... |
| Oil burners, number | 9,000 | 131,300 | 104,000 | 139,432 | ...... |
| Washing machines, value .......... | 30,198 | 82,330 | 50,929 | 62,425 | ...... |
| Heating industry, value .......... | 271,652 | 500,057 | 276,607 | 297,364 | ...... |
| Soda fountains, value | 15,407 | 24,510 | 14,600 | 8,214 | ...... |
| Ice refrigerators and cases, value .... | 33,010 | 60,483 | 40,825 | 30,869 | ...... |
| Electric refrigerators, value .......... | ...... | 146,876 | 128,033 | 128,216 | 193,254 |
| Electric refrigerators, number ........ | ...... | 630,000 | 748,612 | 1,590,024 | 2,240,037 |

coolers. Other fluorine compounds have come into being along with Freon 12, bearing related names and numbers but having, as yet, little industrial importance. Ammonia remains the standard industrial refrigerant.

Ice is still a major method of refrigeration and a large industrial factor. Block ice has shown a steady decline in the last five years, while new forms have been in development for a longer period. Of these, Flak Ice Frozen Water Ribbons have shown great promise, technically and commercially, finding applications in many commercial and industrial markets. This form has a practically fixed surface, independent of weight and flows without the flakes regealing, regardless of age. It is produced and may be handled automatically.

Automatic controls largely operated by mercury type electrical switches make ice plants entirely automatic, starting and stopping as conditions warrant without human attendance, excepting oiling and inspection. Recent developments have carried this automaticity even into the latest ice-making equipment, so that plants may run without any human attendance, that will start and stop, and produce the ice as needed. In these plants, not only is the ice produced automatically, but it is stored automatically and withdrawn as needed, also automatically. Storage of several hundred tons of special forms of ice with automatic equipment for delivering a few pounds at a time into milk crates, ice bags, lettuce crates, chemical reaction tanks, or any place where needed, are now in operation.

All these improvements have introduced into the refrigerating field monel metal, rubber, stainless steel, bearing metals, metallizing, coatings and enamels not heretofore used and have opened up a very considerable line of research most promising for the introduction of new products of the chemical industries.

A major change has been the development of dry ice, solid carbon dioxide which sublimes at —112° F. It is produced either by heating certain limestones or by acid treatment, by a fermentation process, or by burning coke. Large potential sources of carbon dioxide are found in the petroleum industry as a by-product of hydrogen production for hydrogenation and also in blast furnace gases. There are also large fields of natural gas or oil that produce carbon dioxide as a by-product.

Comfort cooling, either in central or small unit systems, has become the major outlet for refrigerating machinery, where it has made up for slack industrial refrigeration equipment demand during depression years. We hear a great deal about methods of getting rid of refrigeration in air conditioning, for refrigeration is the most expensive part of any comfort system, and its cost of operation has consisted largely of the cost of refrigerating and providing the ample water required (a problem largely solved now by the device known as the evaporative condenser). But in general, efforts to design successful cooling systems without refrigerating machinery have been negative. So long as cooling systems must include refrigerating machinery, they are likely to remain expensive, making dubious many expansive claims currently made for this industry. The plain economics is that thus far comfort cooling has been justified only in those places where it has paid someone to have a crowd gather in summer where he could collect the cost of operation through increased sales.

Refrigeration, during the past twenty years, has kept pace with the chemical industries. It has been not only a most useful servant to help in production, but also a valuable customer of many products. As servant, its importance is all out of proportion to its relative investment value, because its chief function is in control of operations involving large values. As customer, it awaits development by the chemical industries of refrigerants and many other products for which it has already developed a waiting market.

In closing I would like to acknowledge the most valuable help of David L. Fiske, Secretary of The American Society of Refrigerating Engineers, in preparing this paper with respect, especially, to its statistical material.

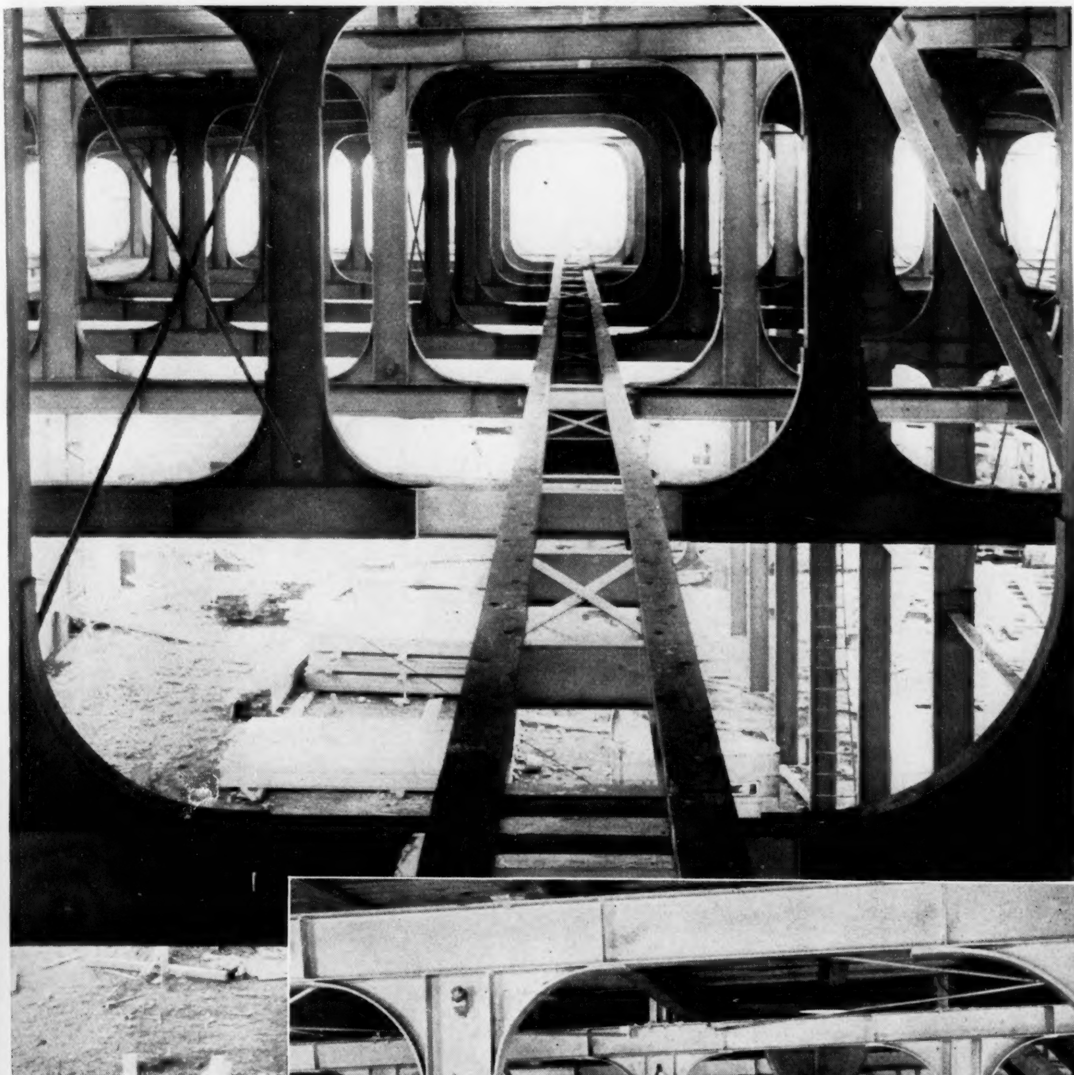
## Nitrogen Fixation Capacity Expands

A comprehensive statistical study of world nitrogen industry has been published under the title, "Nitrogen Fixation Works in the World" by Chisso Kyogi Kai, Tokyo, Japan, by the operators of a large synthetic ammonia plant at Konan, Chosen. From this study it would appear that the number of nitrogen fixation plants has grown from 113 in 1931 to 145 in 1937. All of the new construction has consisted of synthetic ammonia plants. Capacity for all types of nitrogen fixation has increased 50 per cent., according to the study. A summary of plants and capacity by countries as compiled by Chisso Kyogi Kai follows. No attempt has been made by the Department of Commerce to check the accuracy of the figures presented.

DEVELOPMENT OF NITROGEN FIXATION IN THE WORLD
(METRIC TONS)

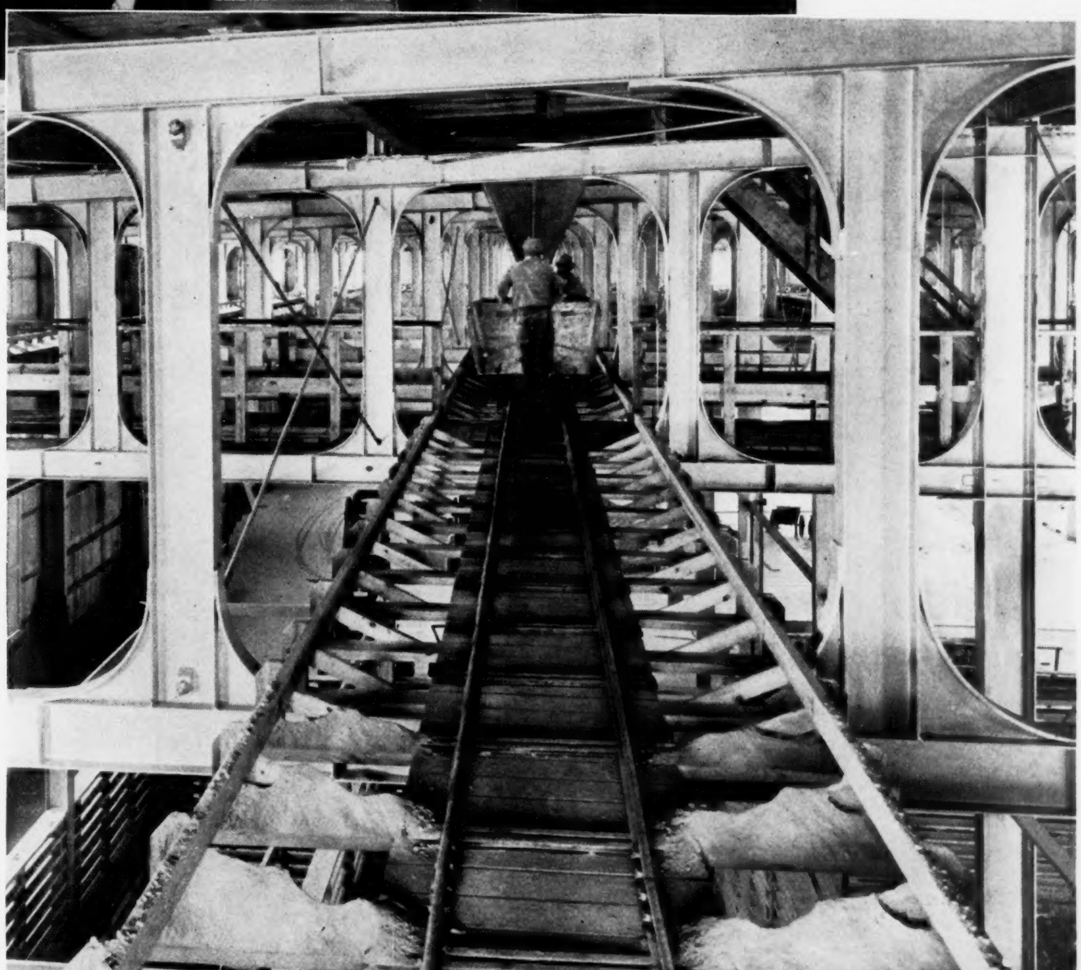
| | 1931 | | 1935 | | 1937 | |
|---|---|---|---|---|---|---|
| Country | Plants | Capacity | Plants | Capacity | Plants | Capacity |
| Germany | 12 | 1,037,000 | 13 | 1,098,000 | 13 | 1,365,850 |
| Japan | 20 | 245,290 | 19 | 343,200 | 21 | 490,132 |
| United States | 8 | 203,650 | 10 | 244,340 | 10 | 292,510 |
| France | 22 | 207,550 | 27 | 241,090 | 27 | 244,050 |
| England | 2 | 185,500 | 2 | 145,870 | 2 | 232,870 |
| Belgium | 5 | 38,500 | 10 | 204,360 | 10 | 217,980 |
| Soviet Union | 1 | 7,300 | 4 | 100,100 | 4 | 157,500 |
| Italy | 14 | 90 250 | 16 | 109,200 | 18 | 146,860 |
| Netherlands | 2 | 34,000 | 3 | 106,000 | 3 | 136,650 |
| Norway | 3 | 108,000 | 4 | 121,000 | 4 | 121,000 |
| Canada | 2 | 73,200 | 3 | 102,000 | 3 | 102,000 |
| Poland | 6 | 99,000 | 5 | 84,190 | 5 | 88,930 |
| Manchuria | — | —— | 1 | 40,000 | 1 | 40,000 |
| Czechoslovakia | 3 | 17,500 | 4 | 37,640 | [illegible] | 37,640 |
| Yugoslavia | 3 | 19,000 | 3 | 23.900 | 3 | 23,900 |
| Sweden | 3 | 8,000 | 3 | 11,250 | 3 | 14,036 |
| Switzerland | 3 | 12,600 | 3 | 13,200 | 3 | 13,200 |
| Spain | 3 | 7,700 | [illegible] | 8,000 | 3 | 8,000 |
| Rumania | 1 | 7,400 | 2 | 8,000 | 2 | 8,000 |
| China | — | —— | | —— | 2 | 7,175 |
| So. Africa | — | | [illegible] | 5,740 | 1 | 5,740 |
| Hungary | — | —— | 1 | 5,740 | 1 | 5,740 |
| Brazil | — | —— | 1 | 3,500 | 1 | 3,500 |
| Bulgaria | — | —— | | 60 | 1 | 60 |
| | 113 | 2,401,440 | 13[illegible] | 3,056,380 | [illegible] | [illegible].323 |

From "World Trade Notes on Chem[illegible] and Allied I[illegible]



**B E F O R E**

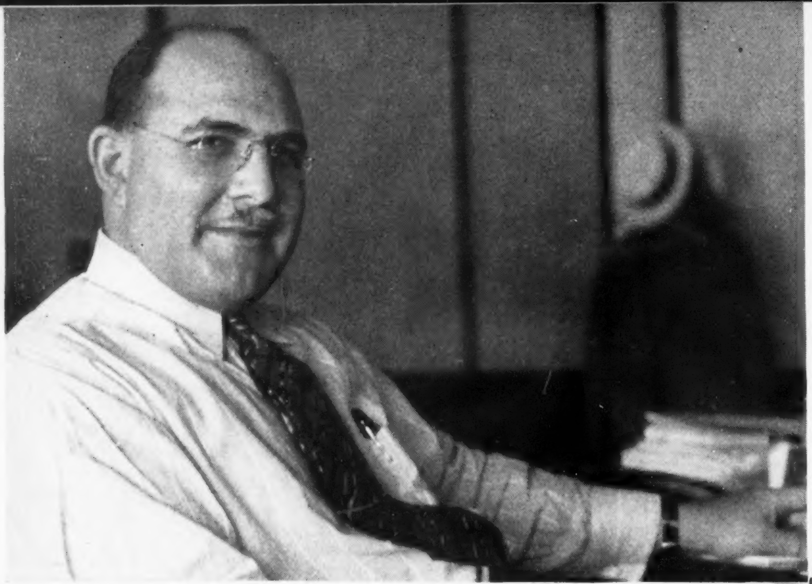
At Chicago Heights, Ill., the International Agricultural Corp. is operating a new modern, mechanized fertilizer plant, where a completely co-ordinated unit turns out a large variety of fertilizer with systematic precision. Plant is unique in that it represents the first commercial application of an all-welded rigid frame truss, especially made to



**A F T E R**

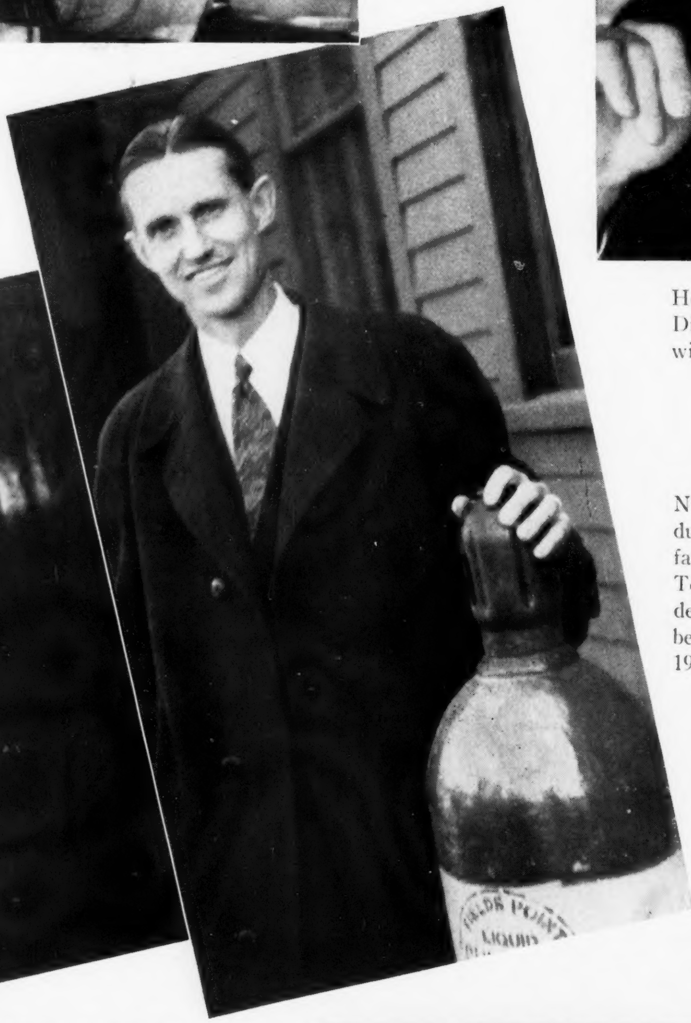
accommodate conveyors in areas just below the roof which are usually useless. Below, industrial cars, transporting fertilizer ingredients, roll right through the portals on tracks which have been installed through four of the twelve 7-ft. portals in the trusses. Above, the trusses in construction. Plant designed and built by the Austin Co.

# Some Chemical Men



J. George Nathanson, president of the Soluol Corp. which makes textile specialties in a brand new, model plant.

Hercules' Providence Drysalters Division is managed by the widely known Walter Bunce.

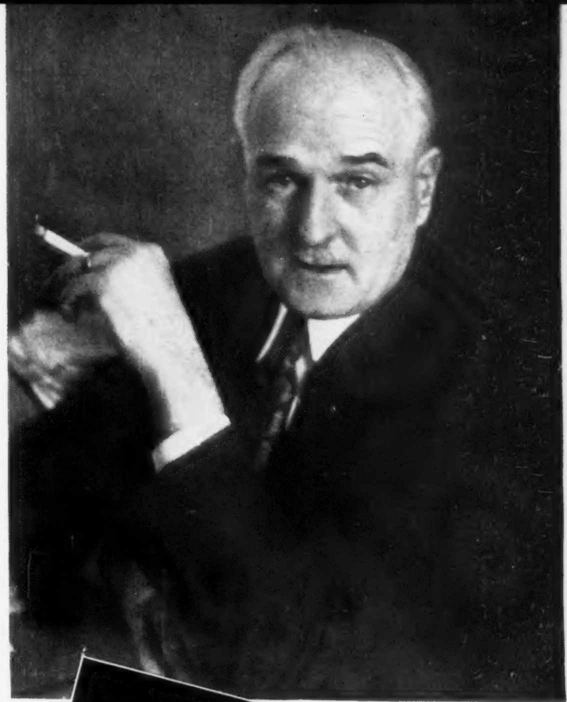


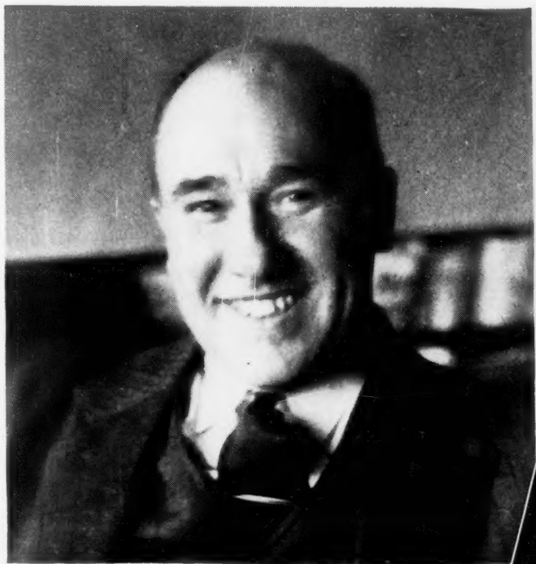
New England's sole alkali producer is the Fields Point Manufacturing Co., of which Daniel Townerd, extreme left, is president, and Nelson C. White has been production manager since 1927.

Walter W. Lane, below left, is purchasing agent of the Warwick Chemical Co., and right, Crane L. Dubeau, Mathieson technical sales development man from Niagara Falls, confers with Robert M. Mannheim, their New England sales manager.

# About Providence, R. I.

The Providence chemical market proverbially represents a bigger consumption than the entire continent of South America, and, as state capital, it is not inappropriate that Robert Mulligan, right, should be not only president of J. U. Starkweather Co., Inc., but also member of the state House of Representatives. Below, center, Howard C. Gerlach is general manager of John D. Lewis, Inc. (synthetic gums and lacquer specialties), and an active leader among New England chemical jobbers. To his right is one of the veterans of the textile specialty field, J. R. Butterworth, Jr., president of the Textile Products Co., and beneath him is H. O. Sydney, owner of one of the finest kennels of Irish setters and president of the Providence Textile Chemical Co. Left, Henry M. Sessions of Sessions-Gifford, aggressive chemical distributors who have recently reopened their burned-out Boston branch and warehouse.



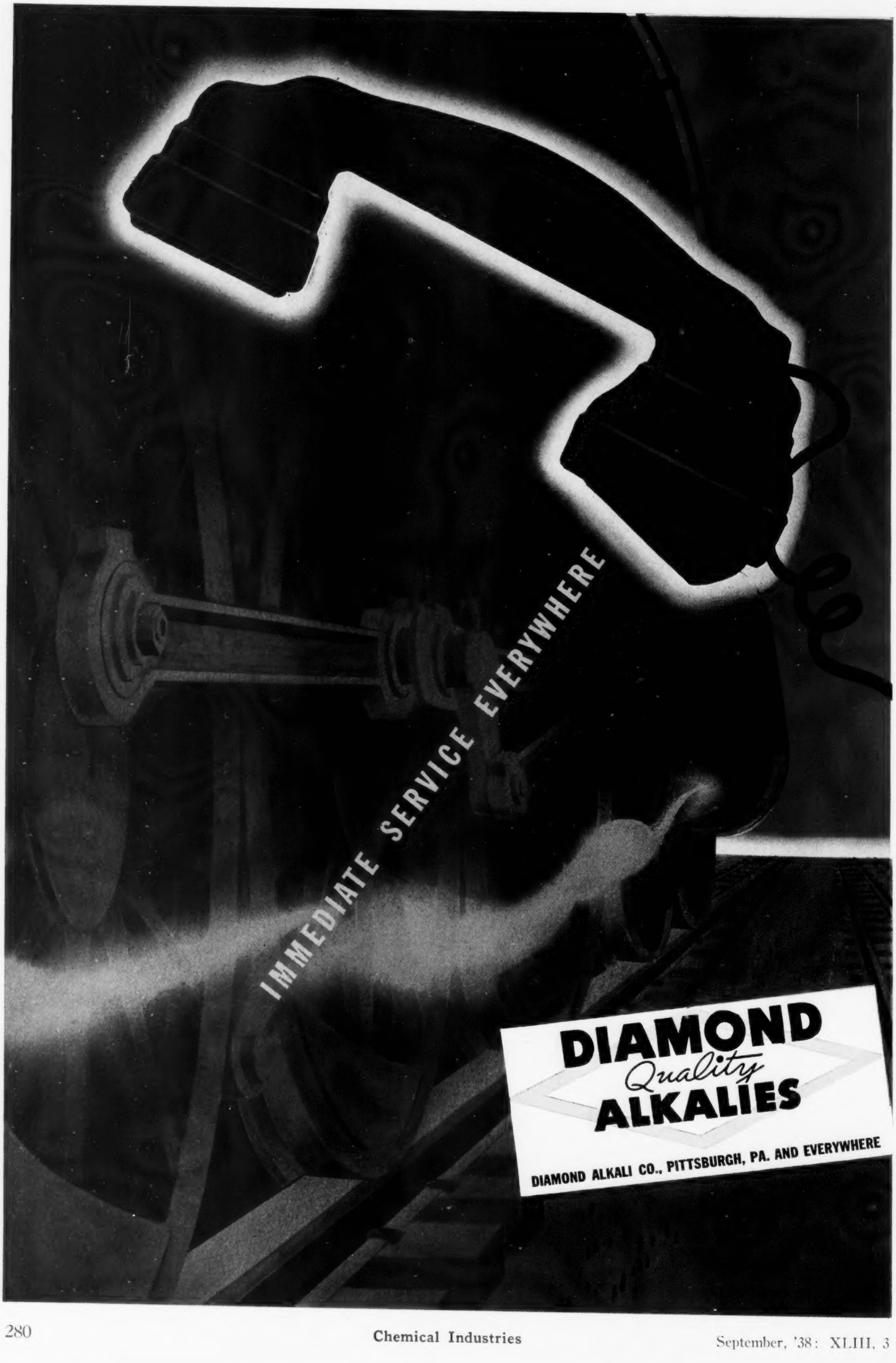


# Lucite Goes to Town

Sparkling, brilliant effects are achieved in costume jewelry through the use of du Pont's Lucite, possible because of the inherent qualities of the plastic and the hand-cutting and carving which permits the play of light through and within the cut surfaces.


The extreme transparency of this unusual plastic makes this visible-in-the-dark Lucite door ring practical by providing maximum magnification for the luminous material which it covers.

Table supports of Lucite strike a new note in home decoration. The rings are firmly clipped to an oblong of opaque coral plastic and are easily removed so that the whole equipment may be stored away flat. The table is useful as a cocktail tray or as a holder for a plant or vase of flowers.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# Plant Operation and Management

*A digest of new methods and plant equipment*

## Thermal Catalysis of CO and Hydrogen

### By A. H. Nissan, B.Sc.*

THERMAL catalytic methods for converting a mixture of carbon monoxide and hydrogen into hydrocarbons and oxygenated organic compounds have only been introduced within the past three decades. The products of such syntheses range on the one hand from methane to solid wax of the paraffin series accompanied by lower and higher olefines and, on the other hand, from lower members of the homologous series of monohydric alcohols through the aldehydes to the fatty acids. It is clear that the number of possible combinations of these primary products to give secondary-reaction compounds is very great. Further, such processes of building up complex molecular structures from the relatively simple molecules of hydrogen and carbon monoxide have unique potentialities.

*Alcohols.* Methanol, made from the same raw materials, carbon monoxide and hydrogen, costs 4.32 to 6.06 cents per gallon, according to estimates by Duffields Coal Products, Ltd., whereas wood naphtha, its original source, costs 50 to 62 cents per gallon.

The actual and the possible uses of methanol are outstanding; it is employed for fine chemicals, including drugs, dyestuffs, disinfectants, insecticides and in the manufacture of artificial resins; as a methylating agent and as a blend for (British) home-produced fuel, for its octane blending value is about twice that of benzol (low coal tar fraction).

The technical applications (solvents, constituents of lacquers) of the higher alcohols are limited. Du Pont in America manufactures n-propyl and iso-butyl alcohols, but the production is economically subordinate to the synthesis and sale of methanol. It seems doubtful therefore whether it could compete with alcohols obtained from other sources. A recent patent by the I. G. claims the production of higher alcohols from water gas under pressure. The alcohols are subjected to dehydration and the resulting olefines are polymerized to dimers and trimers of high anti-knock values.

Formerly commerçial resins were obtained from fossil resins or ambers, from exudations from coniferous trees and from colophony resin by distillation of turpentine. At present the action of formaldehyde on phenol or cresylic acids and on urea or thiourea provides artificial resins. Formaldehyde can be produced from carbon monoxide and hydrogen directly or commercially by catalytic oxidation of methanol obtained from these initial reagents. The search for a durable transparent colorless resin, resistant to shock, is an urgent problem of applied chemistry and involves great potential importance for formaldehyde. Such a substance would be used in preference to glass when brittleness is an objection. Higher aldehydes, ketones, ethers and acids are synthesized from carbon monoxide and hydrogen by varying the temperatures, pressures and catalyst. Of these, possibly, the most important is acetic acid, but at present this acid is manufactured by the oxidation of acetaldehyde, the latter being derived either from calcium carbide or the dehydrogenation (and subsequent oxidation of acetaldehyde) of ethyl alcohol and other processes. The British Celanese Co. and du Pont are carrying out extensive research on the synthesis of this acid from methanol and carbon monoxide. It is possible that this method of synthesis may be the ultimate source of acetic acid.

Catalytic synthesis of simple and oxygenated hydrocarbons is at an early stage of development. Sabatier patented the production of methane from carbon monoxide and hydrogen in 1905, his discovery, however, dating a few years earlier. This pioneer researcher hydrogenated carbon monoxide at 300° using nickel as catalyst in accordance with the equation:

$$CO + 3H_2 = CH_4 + H_2O$$

Difficulties arose where the process was applied on a technical scale due to inhibition or poisoning of the catalyst by sulfur. When the theoretical proportions 1 $CO:3H_2$ were employed, a side reaction proceeded ($2\ CO \longrightarrow C + CO_2$). The liberated carbon was deposited on the nickel thus reducing the activity of the catalyst. To eliminate this side reaction it was found necessary to work below 300° C. and employ a minimum ratio of 1 $CO:5H_2$. This resulted in a large consumption of water gas per volume of methane produced and was accompanied by an excessive volume of untreated hydrogen in the exit gases.

Later Sabatier suggested (1908) the use of water gas prepared at low temperature, for this mixture has a low percentage of carbon monoxide with a high percentage of dioxide; thus H:CO ratio is sufficiently high to allow direct hydrogenation at 300°, sulfur being removed by passing the gases over heated copper.

Erdmann and Bedford attained the same high proportion of hydrogen to carbon monoxide by liquefying blue water gas and then subjecting the liquid to fractional distillation. The gaseous fractions, found to contain from 14 to 17 per cent. carbon monoxide and 75 per cent. hydrogen approximately, were sulfur free and could be passed directly over nickel at 280 to 300°. The resulting product contained approximately 60 per cent. H; 6 to 7 per cent. N; and 30 to 32 per cent. $CH_4$ with calorific value of 480 to 490 B.t.u. per cubic foot.

The work of Vignon extended from 1909 to 1914; it is important for he employed a new catalyst, lime. Water, gas and steam were passed over lime at 800 to 900° and the course of the reaction probably followed the two stages indicated in which active hydrogen is liberated in the first stage which aids in the hydrogenation of the carbon monoxide in the second.

$$CO + H_2O \longrightarrow CO_2 + 2H$$

$$CO + 2H + 2H_2 \longrightarrow CH_4 + H_2O$$

$$\text{or summarizing } 2CO + 2H_2 \longrightarrow CO_2 + CH_4.$$

Lower temperatures could be used provided the lime was mixed with coke in the gas producer itself.

This type of reaction in which two molecules of carbon monoxide react with two of hydrogen was shown to apply to a considerable extent (Armstrong and Hilditch, 1923) in the case of purified water gas passed over nickel at 250° (approximate), but since Vignon's investigations other workers have tried new catalysts in addition to varying the operating conditions. The hydrogenation of coal and tar has produced certain remarkable sulfur resisting catalysts which have been used in the preparation of methane. Thus, Meyer and Horn (1934) subjected the carbon monoxide ordinarily found in illuminating gas to hydro-

* Research Fellow, Dept. Oil Engineering, University of Birmingham, England.

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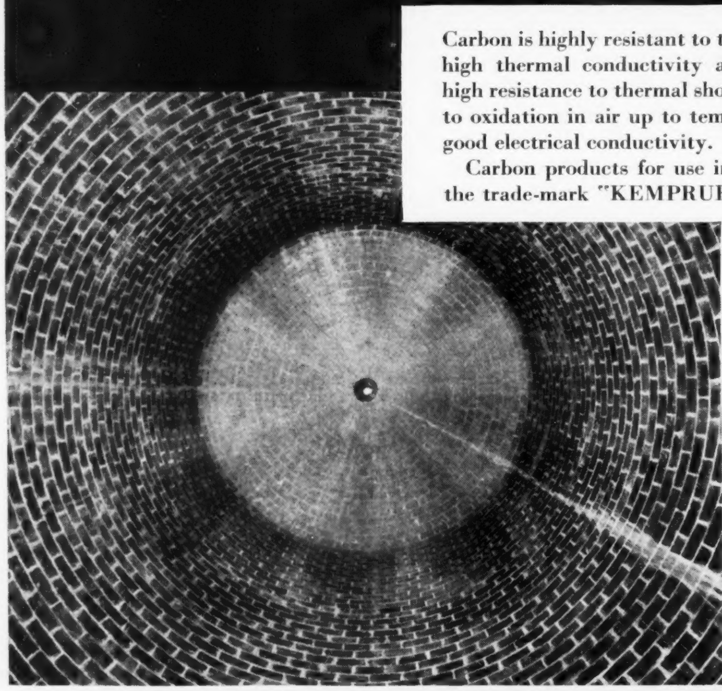

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| 9" Soap | 9 x 2½ x 2 1/16 | 270 Lbs. |
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| No. 2 Arch | 9 x 4½ x (2½-1¾) | 495 Lbs. |
| No. 3 Arch | 9 x 4½ x (2½ x 1) | 405 Lbs. |
| No. 1 Key | 9 x (4½-4) x 2½ | 550 Lbs. |
| No. 2 Key | 9 x (4½-3½) x 2½ | 520 Lbs. |
| No. 3 Key | 9 x (4½-3) x 2½ | 490 Lbs. |
| No. 1 Wedge | 9 x 4½ x (2½-1⅞) | 510 Lbs. |
| No. 2 Wedge | 9 x 4½ x (2½-1½) | 470 Lbs. |

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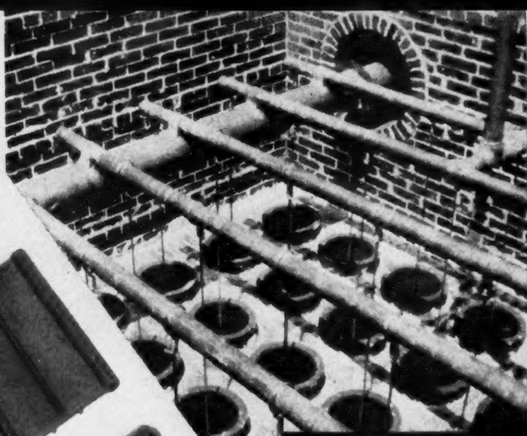

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genation over a molybdenum catalyst at 400° and claim to have obtained good conversions. As recently as 1936, Sebastian used silica gel-supported molybdenum sulfide catalyst and this author worked under atmospheric pressure with a resulting good yield of methane. The Fischer-Tropsch process for producing hydrocarbons under atmospheric pressure yields a product in which methane predominates if the temperature is allowed to exceed 200°, but methane is suppressed to a minimum by rigid control of temperature.

### Synthesis of Oxygenated Compounds

*Methanol.* From the time of Sabatier's far-reaching discovery it was inferred that if the reaction between the parent molecules could be stopped at an appropriate period of its progress, formaldehyde or methanol would be produced according to the following:

$$CO + H_2 \longrightarrow H.CHO \quad \text{or} \quad CO + 2H_2 \longrightarrow CH_3.OH$$

Thus resulted the synthesis of methanol on a large scale by thermal catalysis. After many attempts by various workers the Badische Anilin and Soda Fabrik patented a process (1913) in which was claimed the conversion of carbon monoxide and hydrogen into a mixture of hydrocarbons, alcohols, aldehydes and ketones, methanol being predominant. Water gas compressed to 100 atmospheres at 400° was passed over metals of the iron group with alkalies, zinc or zinc oxide. Patart between 1921 and 1925 claimed that he obtained a good yield of methanol by passing a mixture of water gas and hydrogen, $1CO:2H_2$, over zinc oxide at 400° and high pressures. Since then the two pioneers of this process have issued many patents using mainly zinc oxide as catalyst.

From a thermo-dynamical consideration of the equation, $CO + 2H_2 \rightleftarrows CH_3.OH + 27{,}000$ cals., a decrease in temperature and an increase in pressure favors the reaction from left to right. Morgan, Taylor and Hedley state that if a catalyst could be found to promote the reaction at 200° then data published by Audibert and Raineau indicate that a satisfactory yield of methanol could be obtained even under 1 atmosphere pressure. No catalyst has been found to be reactive at such a low temperature and therefore high pressures are employed to give optimum yields.

The effect of temperature can be studied quantitatively from calculations of $K_p$, the equilibrium constant in the equation,

$$K_p = \frac{P_{(CH_3OH)}}{P_{(CO)}\,(P_{(H_2)})^2}$$

The following table gives results, calculated from Audibert's modified equation and also by Kelley:

| Temp., °C.— | Audibert ($K_p$) | Kelley ($K_p$) |
|---|---|---|
| 300 | $2.65 \times 10^{7}$ | $6.70 \times 10^{7}$ |
| 400 | $1.15 \times 10^{-2}$ | $20.6 \times 10^{2}$ |
| 500 | $5.75 \times 10^{-2}$ | $316 \times 10^{-3}$ |
| 600 | $3.20 \times 10^{-4}$ | $386 \times 10^{-4}$ |
| 700 | $7.55 \times 10^{-6}$ | $1{,}540 \times 10^{-6}$ |

It is to be noticed that the discrepancy between the two sets of results increases with increasing temperature. Morgan and his co-workers have concluded that Audibert's results are the more correct* and are in good agreement with experimental data. The important fact, however, is that a range of temperature between 300° and 400° forms the optimum temperature to be employed in this synthesis. Later work on catalysts showed that although copper-cerium and copper-beryllium gave good yields, the most efficient catalyst was a zinc-chromium combination in which there were 75 atomic proportions of zinc. All equations for hydrogenation and such processes can be split up into two half reactions, one involving a loss of electrons, the other a gain.

*Kelley in deriving $K_p$ did not take into account the specific heat of gaseous methanol.

That is $C_2H_4 + H_2 \longrightarrow C_2H_6$ may be split up into

(1) $2e^- + C_2H_4 + 2H^+ \longrightarrow C_2H_6$

and (2) $H_2 \longrightarrow 2H^+ + 2e^-$

Similarly $CO + 2H_2 = CH_3OH$

(1) $4e^- + CO + 4H^+ \longrightarrow CH_3OH$

(2) $2H_2 \longrightarrow 4H^+ + 4e^-$

It is possible that the catalyst in such reactions acts as a momentary acceptor or donator of electrons. The types of products arising depend on the difference of potentials involved. Langmuir has pointed out that the adsorption of such gases as oxygen and hydrogen is accomplished by resolution of the molecules into atoms.

### Treating Water Gas

Water gas, after being subjected to the electrolytic hydrogen process so as to give the ratio $1\,CO:2H_2$ is passed over granules containing 70-80 atomic proportions of zinc and 30-20 of chromium, the temperature being 350-400° and the pressure 150-200 atmospheres. Sulfur should be rigorously removed and all volatile compounds, particularly the carbonyl of iron, nickel and cobalt not only eliminated but also prevented from being formed within the system. The exit gas from the reaction chamber is condensed under pressure, and the last traces of methanol are scrubbed out with water. A simple distillation yields practically pure methanol.

*Higher Alcohols.* Although methanol has many applications, Fischer and Tropsch realized the greater importance of the accompanying by-products. They examined (1923) the reaction discovered by the Badische Co. whereby higher alcohols and hydrocarbons were produced, with the intention of increasing the proportions of the latter in order to use them as petrol substitutes. Patart (France) experimented with a similar reaction to obtain either substitutes for petrols or definite technically useful alcohols higher in the series than methanol. Higher temperatures were required and lower yields were produced. Fischer and Tropsch advanced the following explanation for the reaction of hydrogen and carbon monoxide to form higher alcohols. Methanol, primarily produced as already explained, reacts with carbon monoxide to form an acid which is subsequently reduced with hydrogen to give an aldehyde, the latter leading on further reduction to an alcohol of higher molecular weight than the original:

$$CH_3.OH \xrightarrow{CO} CH_3.CHO \underset{(-H_2O)}{\xrightarrow{H_2}} CH_3.COOH \longrightarrow$$

$$CH_3.CHO \xrightarrow{H_2} CH_3\,CH_2.OH$$

Morgan and his collaborators found that the addition of rubidium oxide (15 per cent.) to a chromium oxide-manganese oxide catalyst gave the greatest yields of higher alcohols. These workers have investigated extensively the influence of alkalies on the formation of the higher alcohols and oxygenated compounds. Morgan has put forward the following theory for the formation of higher alcohols. The simpler intermediate aldehydes formed in the reaction undergo the simpler aldol condensation; the product loses water and is reduced through certain stages to a higher alcohol. The more reactive hydrogen in the higher aldehyde homologue may react with the aldehyde group, thus forming branched chain homologues.

(1) $CH_3.CHO + HCH_2.CHO \longrightarrow CH_3.CH(OH).CH_2.CHO$

$$\xrightarrow{-H_2O} CH_3.CH = CH.CHO \xrightarrow{H_2} CH_3.CH_2.CH_2.CHO \xrightarrow{H_2}$$

$$CH_3.CH_2.CH_2.CH_2.OH$$

$$(2)\quad CH_3.CHO + H\overset{CH_3}{\overset{|}{C}}H - CHO \longrightarrow CH_3.CH(OH) - \overset{CH_3}{\overset{|}{CH}} -$$

$$CHO \xrightarrow{-H_2O} CH_3.CH = \overset{CH_3}{\overset{|}{CH}} - CHO \xrightarrow{H_2} CH_3.CH_2 - \overset{CH_3}{\overset{|}{CH_2}} -$$

$$CHO \xrightarrow{H_2} CH_3.CH_2.\overset{CH_3}{\overset{|}{CH_2}} - CH_2.OH$$

Taylor states that the results of his investigation into the modified methanol synthesis are in agreement with the aldol theory and this theory has received wide acceptance. Frolich, however, puts forward a simple dehydration theory and American opinion, on the whole, seems to be in favor of such an explanation. Graves believes, after critically studying these two theories with relation to higher alcohols produced by the duPont Ammonia Corp., that dehydration between two molecules of lower alcohols satisfies experimental results. Thus

$$CH_3.OH + H.CH_2.CH_2.OH \longrightarrow CH_3.CH_2.CH_2.OH + H_2O$$

The wide investigations carried out at the National Chemical Laboratory, Teddington, have resulted in the synthesis of aldehydes, ketones, acetals, ethers and acids. Thus, Hardy reports the synthesis of propionic, iso-butyric, methyl ethyl acetic and pivalic acids from interaction of carbon monoxide and alcohols, and Morgan gives an extensive list of products prepared by high pressure synthesis.

Abstracted from *Oil & Gas Journal,* July 21, '38, p. 49. In Part Two of this article, the author will discuss the Fischer-Tropsch process for the synthesis of liquid fuels and lubricating oils.

## Possible Organic Process Reagent

Use of liquefied hydrogen chloride instead of the gas or its aqueous solutions in chemical processes, and its possibilities, were discussed by Dr. E. Schwabe, of Ludwigshafen, in a paper to the joint meeting of several German chemical organizations recently held in Bayreuth (reported in *Chemical Trade Journal,* July 1, '38, p. 7).

Pure liquefied hydrogen chloride is a non-conductor for electricity, and does not attack zinc, magnesium, iron, silver, cadmium, and mercury. Metals which are attacked by the material include aluminum, tin and lead. Most organic compounds are readily soluble in liquefied hydrogen chloride, while in regard to inorganic materials, the only products which possess this property are stannous chloride, phosphorus trichloride, phosphorus oxychloride and phosphorus tribromide. Liquefied hydrogen chloride is manufactured by drying the gas produced by the combination of chlorine and hydrogen in sulfuric acid, compressing it to about 60 atmospheres in an iron compressor and liquefying by cooling. At present, it is employed partially as a convenient means for the production of the gaseous acid at plants which themselves do not manufacture the material, and partly directly in the liquid phase for pressure processes and other chemical reactions. The following instances were given on the possibilities of use of the anhydrous acid:

The conversion of ethylene into ethyl chloride, of acetylene into vinyl chloride, of ethyl oxide into ethylene chlorhydrin, and of vinyl acetylene into 2-chlorbutadiene. Ethyl alcohol on treatment with liquefied hydrogen chloride gives ethyl chloride, and cinnamic acid, cinnamyl chloride.

By the action of anhydrous hydrogen chloride on aldehydes, chlorinated ethers are produced. By the simultaneous action of hydrogen chloride and formaldehyde on aromatic compounds, the chlormethyl group can be introduced into an aromatic nucleus In this way, for instance, toluene can be converted into a mixture of ortho- and para-xylyl chlorides, and metaxylene into dichlormethyl-metaxylene.

Among the reactions that can be effected in the liquid phase, that is under pressure, the following were noted: The conversion of vinyl acetate into alpha-chlorethyl acetate, of allyl alcohol into allyl ether, of ethyl alcohol into ethyl chloride, of aniline into diphenylamine, and of a mixture of ethyl alcohol and aniline into mono- and diethylanilines. Author stated that liquefied hydrogen chloride might have a very important future in the wood saccharification industry.

## Preparation of Inorganic Phosphors

In the preparation of inorganic "phosphors" (fluorescent compounds) without a metallic activator reported by Byler (*J.A.C.S.,* 1938, *60,* 1,247-1,252), substances were found to become fluorescent when heated just above a transition or decomposition temperature. Thus, barium chloride became fluorescent when heated above its transition temperature, so that it was partially converted to its allotrope; the hydrated sulfates of zinc and magnesium, and strontium chloride behaved similarly when heated to partial dehydration.

A detailed study was made of the behavior of some of the calcium phosphates. A fluorescent product could be obtained by precipitating the dibasic phosphate from calcium chloride with sodium phosphate at a pH of 5.5, followed by washing and firing. The optimum temperature of firing was 400°, and X-ray examination of the product showed that it was a mixture of the dibasic phosphates and another compound, presumably the pyrophosphate. Products of much higher fluorescent power could be obtained by washing the phosphate precipitate with dilute hydrochloric acid, in which case the extent of the fluorescence developed was very sensitive to the pH and amount of the wash water. When hydrochloric acid of a pH of 3 was used, the optimum effect was obtained, provided the amount of washing exceeded a certain figure. Similar results were obtained by performing the precipitation in solutions of a different pH.

Products of equal fluorescent power to the last were obtained by precipitating hydroxy-apatite, $3Ca3(PO4)_2 . Ca(OH)_2$, by adding normal sodium phosphate to an ammoniacal solution of calcium chloride and ageing the product in dilute phosphoric acid solution. Here again the pH and time of ageing were found to exert a profound influence on the extent of the fluorescence developed when the products were fired; 10 hours at a pH of 2.3 was found to be most efficient treatment. In all cases 400° C. was the best calcination temperature, and in most cases X-ray examination showed the products to be mixtures.

It was concluded that fluorescence of inorganic compounds, in the absence of the usual trace of a foreign ion, results from the formation of a mixture of two related compounds of critical composition, in which the crystal structure is distorted from that of either of the two pure components (mentioned in *Chemical Age,* June 18, '38, p. 478).

## Increased Luminescence

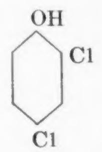
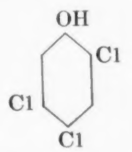
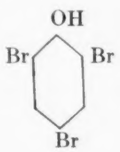
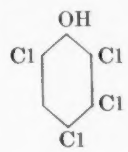
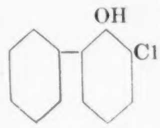
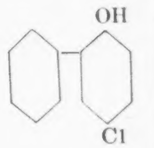
A method of prolonging the duration of luminescence of zinc sulfide used in luminescent paints has been devised in Germany (*Chemical Age,* July 2, '38, p. 13). If the preparation of the sulfide is carried out so that it will contain about 2 per cent. of zinc oxide, this result can be attained. Method used is either to add a suitable quantity of oxide before calcining or to use an oxidizing calcination method and continuing calcination for two to three hours.

## Degasifying Liquids

Liquids are freed from gas bubbles by flowing through a trough having transverse baffles obstructing the passage of the upper layer of liquid, but leaving free spaces for passage of the lower layer. The spaces may be adjustable, or floating baffles may be used whereby the spaces are automatically adjusted according to the density of the liquid. Several troughs may be used either in series or parallel. Method is basis of E. P. 480,206 (1936), mentioned in *Chemical Trade Journal,* June 10, '38, p. 499.

**No. 4**

***This is the fourth of a series of advertisements announcing a new list of products for which DOW has developed new processes of manufacture. The DOW Chemical Company invites inquiries from organizations interested in these products. Copies of previous advertisements will be furnished upon request.***

| *Product* | 2, 4-Dichlorophenol, Technical | 2, 4, 5-Trichlorophenol | 2, 4, 6-Tribromophenol | 2, 3, 4, 6-Tetrachlorophenol, Technical | 2-Chloro-6-phenylphenol, Technical[1] | 4-Chloro-6-phenylphenol, Technical[2] |
|---|---|---|---|---|---|---|
| *Formula* |  |  |  |  |  |  |
| *Molecular weight* | 163.0 | 197.4 | 330.8 | 231.8 | 204.5 | 204.5 |
| *Properties* | White crystalline solid with a phenolic odor | Brown solid with a strong phenolic odor | Light pink crystals or powder with a characteristic odor and sweet astringent taste | Brown to black crystalline solid with a strong characteristic odor | Clear, colorless to straw-colored, viscous liquid with a faint characteristic odor | White to light tan, fine crystals with a characteristic odor |
| Boiling Point | 96° C. at 10mm. | 117° C. at 10mm. | Sublimes | 150° C. at 10mm. | 172° C. at 10mm. | 163° C. at 10mm. |
| Melting Point | 40-42° C. | 61.5-63.5° C. | 91.5-92.5° C. | 50-60° C.* | <-20° C.* | 65-70° C. |
| | | | | *Freezing Point | *Freezing Point | |
| *Solubility at 25° C.* | | | | | | |
| Alcohol | V. sol. | V. sol. | V. sol. | V. sol. | $\infty$ | Sol. |
| Carbon Tetrachloride | V. sol. | V. sol. | Sl. sol. | Mod. sol. | $\infty$ | Mod. sol. |
| Ether | V. sol. | V. sol. | V. sol. | V. sol. | $\infty$ | V. sol. |
| Water | Insol. | Insol. | Insol. | Insol. | Insol. | Insol. |

1 Contains 4-Chloro-6-Phenylphenol
2 Contains 2-Chloro-6-Phenylphenol

Other phenols available include:

| | | | |
|---|---|---|---|
| Phenol | o—Phenylphenol | o—Cyclohexylphenol | 2—Bromo-4-tert. Butyl Phenol |
| o—Chlorophenol | p—Phenylphenol | p—Cyclohexylphenol | Bis Phenol-A (p, p′-Isopropylidene Bisphenol) |
| p—Chlorophenol | p—tert. Butyl Phenol | 2-Bromo-4-phenylphenol | |

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# Booklets & Catalogs

**How to get these booklets: Companies will be glad to supply copies free, provided "Chemical Industries" is mentioned and the request is made on company stationery. Your business title should also be given.**

**Acid-proof Brick Tank Linings,** Bulletin 48, covers complete acid brick lined tanks for chrome plating, muriatic and hydrofluoric acid pickling; advantages of these linings in electrolytic processes and in higher temperature acid treatments is explained. Heil & Co., 3088 W. 106th st., Cleveland, O.

**Acid-Proof Chemical Stoneware,** an attractive and informative catalog covering General Ceramics' complete line for the chemical and allied industries; invaluable to executives and engineers in these fields; divided into 12 classifications; contains full information on the wide range of stoneware equipment available for the manufacture, storage, handling and processing of chemically active products where complete resistance to corrosion is desired, and imparts a wealth of other information, such as installation data, charts of characteristics of centrifugal pumps, technical data on handling corrosive liquids, etc.; bound so that additional bulletins may be inserted at any time; available to engineers and executives. General Ceramics Co., 30 Rockefeller Plaza, N. Y. City.

**Adsco Heat Economizers,** Bulletin No. 35-76, of special interest to building owners, schools, manufacturers, etc., using hot water for domestic purposes or processing work; illustrates two applications and contains two charts. American District Steam Co., No. Tonawanda, N. Y.

**Amercoat Coatings,** booklet, describes line of corrosion-proof, sprayable plastic coatings for concrete, metal and wood surfaces, complete descriptions, features and illustrations given, recommended applications and application procedure included. Amercoat Sales Agency, 5905 Pacific blvd., Huntington Park, Calif.

**Automatic Time Switches,** Type TSA-14, for control of A-C or D-C circuits, Bulletin GEA-2963, descriptions, time cycles, and ratings given; also specifications. General Electric Co., Schenectady, N. Y.

**Blast Cleaning and Dust Control Equipment,** folder, of interest to those responsible for blast cleaning costs, lists some equipment available for this purpose. Pangborn Corp., Hagerstown, Md.

**Chemical Topics,** August, 1938, a monthly news sheet reporting new chemical products and processes, published by Monsanto Chemical Co., Merrimac Division, Boston, Mass.

**Chemicals by Glyco,** catalogue, new edition of wide interest to chemists, technical workers and manufacturers of many different industries, written more as a suggestion book of uses rather than a catalogue of company's products; covers main properties and applications, and contains useful tables and general information, with complete index in back. Glyco Products Co., 148 Lafayette st., N. Y. City.

**Circular, Rectangular, and Hand Magnets,** Bulletin No. 25, various uses, both for magnetic separation and other special purposes, together with illustrations and descriptive data, are given. Stearns Magnetic Mfg. Co., Milwaukee, Wis.

**De Haen's Fixanal Preparations,** for standard solutions, leaflet, information on Fixanal Preparations, correctly weighed and standardized analytical chemicals, which when diluted according to directions produce accurate volumetric solutions ready for instant use; accuracy certified to be within 2 parts per 1000; special normalities available for sugar factories, oil and fat research laboratories, wine tests, blood and urine analysis, milk tests, smelting works laboratories, and benzol tests. Pfaltz and Bauer, Inc., 350 5th ave., N. Y. City.

**Dow Diamond,** August, 1938, interesting article "Down the River," story of the success of Dow's quarter-million phenolic waste disposal plant. Dow Chemical Co., Midland, Mich.

**Duplex Switchboards,** with secondary control and protective equipment, Bulletin GEA-2892, outstanding features described and illustrated. General Electric Co., Schenectady, N. Y.

**Dyestuffs,** July, 1938, a fund of valuable information and data for dye users. National Aniline & Chemical Co., Inc., 40 Rector st., N. Y. City.

**Engineering Data on Tube Alloys,** in loose leaf form, for tube designers and production engineers, practical data which simplifies otherwise laborious calculations by providing derived constants in shape of tables and formulas; general characteristics of D-H filament alloys given, including conversion tables and filament specifications for different melts. Information available to engineers identified with tube design or manufacture. Driver-Harris Co., Harrison, N. J.

**Engineering, Design, Construction,** folder, outlines services offered the industrial chemical industry in the organization of complete plants and engineering services rendered, involving pyrolysis, heat transfer, extraction, absorption, adsorption, evaporation, azeotropic phases and distillation. E. B. Badger & Sons Co., Boston, Mass.

**Flow Control,** Bulletin 170-1, contains unusual amount of application data on instruments for control of flow in industrial processes such as controlling hot and cold oil, gas, molten sulfur, acids, chemical solutions, etc., discussion of Stabilog flow controller, theory of flow control, and principal features outlined. Foxboro Co., Foxboro, Mass.

**Gas Engines,** Type PVG, Bulletin 10,011, on new engine shown for first time at International Petroleum Exposition at Tulsa; designed for use wherever gas is available as a fuel. Ingersoll-Rand Co., Phillipsburg, N. J.

**Givaudanian,** Industrial Aromatics Division, July, 1938, feature article "How Aromatics Are Used in Various Industries"; other interesting items on ink odor, fixatives, and synthetic oil of witch hazel. Givaudan-Delawanna, Inc., 80 5th ave., N. Y. City.

**H-O-H Lighthouse,** August, 1938, feature article "Laboratory Waters"; describes Haering system of water analysis and service for producing satisfactory results. D. W. Haering & Co., Inc., 3408 Monroe st., Chicago, Ill.

**How to Handle It if It is Wood,** catalogue, picturization of where and how Rex Chain and Conveyors are used in lumber and pulp mills, of particular interest and value to anyone connected with this industry; catalog style description in back of book gives specific information on the products themselves. Chain Belt Co., Milwaukee, Wis.

**Hydraulic Footlift Truck,** Circular 134, complete details and illustrations. Lewis-Shepard Co., 245 Walnut st., Watertown, Mass.

**Magnetic Separators,** folder, on spout type, for removing tramp iron; features different units available. Stearns Magnetic Mfg. Co., Milwaukee, Wis.

**Merck Chemicals,** medicinal, analytical, technical, photographic, Price List, August, 1938. Merck & Co., Rahway, N. J.

**Metco Metallizing Gun,** Bulletin 37, on Type E, said to be excellent for restoration of worn machine parts of all kinds and for use in application of corrosion resistant metal coatings to all types of equipment, details application, operating and construction data, and gives outstanding features. **Metallizing Process,** using Metco equipment, Bulletin P 10, explains general applications of the process and presents many actual illustrations. Metallizing Engineering Co., 44 Whitehall st., N. Y. City.

**Moly Matrix,** June, 1938, feature article "Molybdenum Cast and Wrought Steel Adapted for Low Temperature Service." Climax Molybdenum Co., 500 5th ave., N. Y. City.

**Multiwall Bag Closing Made Easy by Bemis,** illustrated booklet, complete descriptions of equipment made and service rendered by company; offers users of Multiwall bags benefit of data on packaging problems assembled by company's engineering staff. Bemis Bro. Bag Co., 601 So. 4th st., St. Louis, Mo.

**Neoprene Notebook,** July, 1938, feature article "Swelling Not Most Important Consideration in Evaluating Oil Resistance," also other engineering data. E. I. du Pont de Nemours & Co., Wilmington, Del.

**Oliver-Campbell Cachaza Filter,** Bulletin No. 207, explains economic and operating advantages, includes illustrations, charts, and data sheet. Oliver United Filters, Inc., 33 W. 42d st., N. Y. City.

**Phoenix Flame,** No. 7, this splendidly edited house organ devotes three pages to a discussion by G. B. Cloran on some of the pitfalls which manufacturers should avoid in package planning. Phoenix Metal Cap Co., 2444 W. 16 st., Chicago, Ill.

**Plast-O-Line,** a thermoplastic tank lining material possessing unusual flexibility, as well as resistance to chemicals and acids, data sheet 652, stresses wide range of temperature in operation noteworthy for this material, physical and chemical properties given. Heil & Co., 3088 W. 106th st., Cleveland, O.

**Precision Bench Lathe,** 12-speed, 9-inch swing, Catalog 46-A, illustrates, describes and prices new lathe, contains valuable information on shop work. South Bend Lathe Works, So. Bend, Ind.

**Price List,** August, 1938. Mallinckrodt Chemicals. Mallinckrodt Chemical Works, St. Louis, Mo.

**Price List and Catalog,** July-August, 1938, essential oils, etc. Magnus, Mabee & Reynard, 16 Desbrosses st., N. Y. City.

**Protection Against Chemicals,** Bulletin 50, shows, among other items, example of company's Nocordol carbon heating devices for use in muriatic and hydrofluoric acid solutions, including steam jets, coil loops, and electric immersion units; process equipment lined with homogeneous bonded lead is also shown. Heil & Co., 3088 W. 106th st., Cleveland, O.

**Pulverators or Hammer Mills,** Bulletin 1467-A, covers complete line of multi-impact pulverators or hammer mills recommended for pulverizing coal, limestone, oyster shells and other non-abrasive materials; design construction, size and capacity tables and dimension sheets included. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**Reduced Voltage A-C Magnetic Starters,** Bulletin GEA-2954, on oil-immersed, auto-transformer type No. CR7051, gives construction details, dimensions and ratings, and overload-relay data. General Electric Co., Schenectady, N. Y.

**Refinery Process Pumps,** Bulletin 2432, on Class FH and FL, designed for refinery processes such as those in which hot oils, distillates, solvents, etc., are handled; descriptive literature, specifications and approximate dimensions given. Ingersoll-Rand, 11 B'way, N. Y. City.

**Ruggedwear Resurfacer,** folder, on product for solving concrete mending problems, buying information listed on back. Flexrock Co., 800 No. Delaware ave., Phila., Pa.

**Seitz Tank Furka,** leaflet, features new, original cylindrical filtering unit, said to provide a larger filter surface in a compact container and greater simplicity in operation and handling than the square-frame type of alluvial filter; gives specifications, applications, and illustrations. American Seitz Filter Corp., 480 Lexington ave., N. Y. City.

**Slurry and Sludge Pumps,** Bulletin 173, descriptive data and performance tables, explaining design that enables these pumps to handle thick mixtures without choking, also instructions for submitting inquiries. Morris Machine Works, Baldwinsville, N. Y.

**S S Unit Close Coupled Centrifugal Pumps,** Bulletin 1653, on line covering a range of 10 gpm against 10' head to 1600 gpm 120' head, and for lower capacities up to 300' head; includes capacity tables, showing ratings obtainable and recommended motor sizes and speeds for various ratings, dimension sheets and useful data in figuring pump installations. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**The New Jersey Zinc Activator,** June, 1938, contains first installment of series of articles on recent improvements in zinc oxide and zinc sulfide pigments for white rubber compounds, an especially interesting topic at the present time. New Jersey Zinc Co., 160 Front st., N. Y. City.

**Thiokol Facts,** Vol. 1, No. 14, a resume of latest developments in adaptations of Thiokol. Thiokol Corp., Yardville, N. J.

**Type C Steam Turbines,** for driving pumps, forced and induced draft fans, compressors, pulp beaters, etc., Bulletin 2084-A, points out application, design and advantages, specifications are given for various types. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Type U De-Ion Air Circuit Breakers,** Booklet 33-675, line designed for indoor service, especially in generating and industrial plants where reliability under severe operating duty and minimum space is important, descriptions and illustrations. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**Wholesale Price List,** August, 1938, Fritzsche Bros., 76 Ninth ave., N. Y. City.

# New Chemicals for Industry

***A digest of products and processes***

## Fatty Acids from Paraffins

FURTHER light on present German methods for production of fatty acids from higher hydrocarbons is shed by the full report in *Angewandte Chemie* (August 13), (published in *Chemical Trade Journal*, Aug. 19, '38, p. 156) of a paper Dr. G. Wietzel, of the I. G., read to a meeting of German chemists held in Bayreuth.

Apparently, serious interest by the I. G. in the process dates back to 1921, and five years later an experimental plant was erected in Oppau. Between 1928 and 1930, several tons of synthetic fatty acids made at this plant were supplied to the larger German soap works, and were found quite suitable for the production of ordinary grades of soaps. Process was not, however, considered as being of exceptional promise in Germany, owing to the lack of natural petroleum supplies. In 1931, the I.G., in cooperation with Standard Oil of New Jersey, erected in Baton Rouge, La., a larger experimental plant with a daily capacity of three tons of fatty acids, using mineral paraffin as raw material. Plant was operated for two years, and the experience gained enabled considerable improvements.

Work on the oxidation of the soft paraffins produced in the Fischer-Tropsch synthesis was commenced in 1934 by the Deutsche Fettsäure Werken, an organization formed by the Henkel Co. of Dusseldorf and the Märkische Seifenindustrie of Witten. The D.F.W. apparently worked out on the pilot-plant scale its own oxidation process, and this was later found to be almost identical, even in regard to the catalyst, with the one that had been elaborated by the I.G. The main difficulty in the process, however, is that of isolating the fatty acids from the oxidation mass; and in this particular direction, the experience of the I.G. was both lengthy and comprehensive, and this factor made advisable the consolidation of the two groups of interests that has since taken place.

According to Dr. Wietzel, the actual oxidation stage can be effected with pure oxygen, with air, or with oxygen carriers such as nitrous gases or nitric acid. In practice, air oxidation is being employed, but the I.G. has successfully carried out the process with nitric acid and with nitrous gases. The paraffin is oxidized in the liquid phase, since, if employed in the gaseous phase, it undergoes a change that is too far-reaching. The oxidation can be effected in temperatures between 80° and 170°C., the volatile constituents, which are removed by the air current, being separated by cooling and forming the so-called "distillate."

All the available evidence points to the oxidation products being practically wholly straight-chain materials, even when the paraffin utilized contains a considerable percentage of branched hydrocarbons. The attack of the oxygen consequently seems to be mainly on the tertiary carbon atom, with consequent breaking of the branched chain. The fatty acids formed are, on the average, of shorter chain length than the original paraffin; and the fact that the fatty acids are mixtures of products of varying chain length, indicates that any one of the $CH_2$ groups in the molecule may be the one chosen for oxidation. The end $CH_3$ groups are usually unchanged, since they are considerably more resistant to oxidation than the $CH_2$ groups.

In addition to the true fatty acids, oxy-acids of various kinds are invariably produced. These materials seem to be of the non-lactone forming type, and to be present as estolides or as free oxy-acids. The actual chemistry of the oxidation process has not yet been fully elucidated, though it seems possible that peroxides or hydroperoxides are intermediate stages.

The main object of the oxidation stage is to minimize the production of over-oxidized materials, and this aim is realized by compliance with the following conditions: (1) Cessation of the process before all the paraffin is oxidized. (2) Use of temperatures as low as possible, between 80° and 120° C. being found the best practical range. (3) The application of suitable combinations of catalysts with the object of lowering the oxidation temperature and of directing the process in the desired direction. (4) The treatment of the paraffin with as finely divided an air spray as possible.

In technical practice, the paraffin to be oxidized is mixed with the unsaponifiable contents of an earlier charge, mixed with the catalyst, introduced in the fluid conditions into the oxidation vessel and blown with air. According to the nature of the paraffin and the type of pre-treatment, the reaction is characterized by a longer or shorter induction period. The oxidation is exothermic, the heat of reaction being removed by water cooling. When the product under treatment has acquired a certain saponification value, which varies with the type of paraffin used from 100 to 200, the oxidation is stopped, the product blown from the vessel by compressed air, and further worked up. The oxidation can be effected under pressure, but in this case the composition of the materials obtained cannot be so closely controlled. The raw materials can range from the softest to the hardest paraffins, it being essential to adjust the time and type of treatment to the actual raw material used.

The oxidation product obtained with its fatty acids, oxy acids and unchanged paraffin, is rather a formidable mixture, the separation of the constituents of which proved the most difficult stage in the whole process. The oxidation mass is first agitated with alkali lye, and, after settling, it forms two layers, the lower being a soap solution and the upper being characterized as "Unsaponifiables I". A considerable amount of unsaponifiable matter, however, still remains in the soap solution, and for the separation of this, two processes have been developed. According to the first process, the aqueous soap solution is treated in counter-current at temperatures between 60° and 80° C. with a solvent. The most suitable solvents have been found to be mixtures of alcohols, particularly propyl and butyl alcohol, and certain petrol fractions. The "Unsaponifiables II" can also be distilled from the soaps at temperatures between 300° and 400° C. The difficulty in this method is to bring the true soaps to the required temperature without decomposition. This difficulty has been largely overcome, and it has been found in practice that working with coal- and tar-hydrogenation products as the starting materials it is possible to reduce the unsaponifiables in the fatty acids made to 1 per cent. or less. During this distillation process, however, the fatty acids are improved, particularly in odor.

The crude soap mixtures obtained by either of the above two processes, however, are still not pure enough to meet the requirements for a general soap. They are consequently further worked up by decomposition with a mineral acid, and purification of the crude fatty acids so obtained in modern vacuum distillation plant. Much of the fatty acid produced is unsuitable, owing

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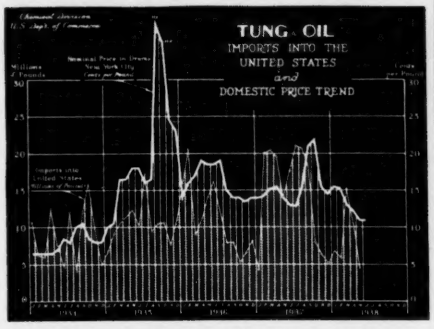
# SOLVENT NEWS

Reg. U. S. Pat. Off.

September ★ A Monthly Series of Articles for Chemists and Executives of the Solvent-Consuming Industries ★ 1938




**Tung Oil's price decline which began in January, 1938, was checked for the first time last May, when the curve leveled off. Monthly imports in May were at the lowest level since January, 1937.**

## Produces Two-tone Metal Finish With Single Paint

BUFFALO, N. Y.—Only one type of paint product is needed to simulate two-toned metallic effects, such as hammered metal, according to a patent recently granted inventors here. Applied by spray gun, the finish is said to develop a hammered appearance almost immediately and may then be air-dried or baked.

Droplets from the spray gun form craters surrounded by shallow ridges, the inventors explain. Because the metallic powder migrates to the ridges while the granular pigment concentrates in the craters, the inventors continue, the color of the powders predominates at the ridges, while the craters are colored by the pigments. Two-toned effects are obtained by proper selection of metal powders and granular pigments, the patentees reveal.

A typical formulation for producing a hammered steel finish is given as follows:

| | |
|---|---|
| Carbon black | 0.51% |
| Antimony oxide | 9.68 |
| Diatomaceous earth | 1.54 |
| Aluminum bronze paste (about 66% aluminum powder and 34% mineral spirits) | 1.54 |
| Alkyd resin solution (50% resin, 50% solvents) | 47.94 |
| Mineral spirits | 1.74 |
| V. M. P. naphtha | 19.40 |
| High flash coal tar naptha | 1.22 |
| Xylol | 0.07 |
| Toluol | 16.36 |
| | 100.00% |

Other compositions may also be used for the paint, according to the inventors, as for example, oleoresinous varnishes, oil modified alkyd resins or clear nitrocellulose lacquers.

## Names Alcohols Which Retard Or Activate Seed Germination

PARIS, FRANCE—Immersing plant seeds in alcohol may retard or accelerate germination, depending on the kind of alcohol, it is revealed in the Bulletin of the Society of Portugues Scientists, published here.

Studying the effect on Brassica seed, the authors report that contact with ethyl alcohol for 15, 30 and 60 minutes retards but does not inhibit germination, resulting in smaller and chlorotic plants. Methyl alcohol, however, is said to accelerate germination after 20 to 90 seconds immersion, but for longer periods, acts the same as ethanol. Butyl alcohol activates germination, even with prolonged periods of contact, the article continues, whereas amyl alcohol generally exerts a retarding action and produces atrophied plantules.

## *Alcohol-Dispersed Stearate Gel Is Base For Improved Water-proofing Material*

LONG ISLAND CITY, N. Y.—How addition of ethyl alcohol to a gel of aluminum stearate transforms it into a thin, transparent, colloidal liquid suitable as a base for new waterproofing compositions is revealed in a patent just granted to an inventor here.

The resulting compositions are substantially colorless, and, if applied by brushing, spraying or immersion, will waterproof stone, brick, leather, fabric and paper "throughout their useful life," the inventor asserts.

In broad terms, they may be described as consisting of (1) at least one water-insoluble, fatty acid soap; (2) preferably a solid or semi-solid hydrogenated fish oil; (3) at least one hydrocarbon solvent; and (4) an alcoholic dispersing agent. The following is cited as a typical formulation:

| | Percent |
|---|---|
| Aluminum stearate | 6 |
| Hydrogenated menhaden oil | 6 |
| Hydrocarbon solvents, e.g. xylene and varsol (defined in patent papers) | 87 |
| Ethyl alcohol | 1 |
| | 100 |

The procedure is to prepare a gel by heating xylene and aluminum stearate at approximately 180° F., dispersing this with alcohol, and then adding the hydrogenated oil to the hot dispersed colloidal solution.

The unusual water-repellent properties of the composition are believed to result from a definite coaction between the several ingredients.

## Dry Ice Concrete Freezer

New York, N. Y.—Concrete or concrete aggregate specimens can be frozen with dry ice in acetone or kerosene by means of an inexpensive freezer described here recently. By alternately placing test cylinders in the freezer and in water at 70°F. for 30 minute periods, 24 freezing and thawing cycles are obtained per day, the article states.

## Promote Super Pyro Anti-freeze With Enlarged Campaign

### U.S.I. Tells '38 Plans As Early Orders Indicate Sales Boost

### LARGEST OUTDOOR USER

Over 8,000 outdoor posters in 500 centers and a 20% increase in space in four leading national magazines will constitute the foundation of the 1938 consumer advertising campaign to promote Super PYRO, the quality anti-freeze manufactured and distributed by the U. S. Industrial Alcohol Co.

Introduced in 1933 as the original, popular-priced, premium quality anti-freeze retailing at $1.00 per gallon (25c qt.), Super PYRO has maintained its leadership for six years. More than $1,500,000 has already been spent on the promotion of Super PYRO, resulting in a jump from 800,000 users in its first year to over 4,000,000 last winter and a total to date of 15,000,000.

The outstanding benefits derived from the use of Super PYRO include:

1. **Full Strength and Concentrated:** Provides extra margin of protection.
2. **Stops Rust and Corrosion:** Cooler running engine, freedom from radiator repairs.
3. **Longer Service:** Special oil reduces evaporation and loss from "after boil."
4. **Economy:** Complete winter protection at lowest cost.
5. **Non-poisonous:** No injurious effects from inhalation.
6. **Characteristic Color:** Retains color in radiator all season.

Motorists in 45 states will see the Super PYRO 24-sheet posters which, this year, feature the famous "Old Man Winter" in various poses depicting "defeat" with the caption, "has beaten Old Man Winter in 15,000,000 cars."

The magazine schedule provides up to five insertions in the *Saturday Evening Post, Colliers, Liberty* and *Country Gentleman.* The magazine campaign which begins about November 1st, provides a circulation of 9½ million readers and a total of 35,000,000 "impressions."

*(Continued on next page)*


**OVER 8,000 OF THESE POSTERS will appear approximately two weeks before the first cold spell in 500 centers in 45 states as part of U.S.I.'s 1938 campaign to promote Super PYRO anti-freeze. The consumer advertising schedule also includes color pages in four national magazines, radio and newspapers in certain metropolitan markets.**

September ★ **SOLVENT NEWS** ★ 1938

## Printing Ink Chemists Prefer Solox In Making Alcohol Bleeding Tests

NEW YORK, N. Y.—SOLOX*, proprietary solvent manufactured by the U. S. Industrial Alcohol Co., is the preferred solvent for making alcohol bleeding tests on pigments used for printing inks, it is announced in a recent issue of the *American Inkmaker*. Details of the test, which was formulated by the Technical Committee of the Printing Ink Production Club, are as follows:

> "The pigment and varnish are mulled together in the same ratio as used in the strength test, or the mulled ink remaining from this test may be used. A dried draw-down or solid print of the ink, leaving some of the clear paper showing is suspended in a test tube three quarters full of SOLOX*, or equivalent brand of denatured alcohol, and allowed to remain for thirty minutes. At the end of this time the draw-down or print is removed from the test tube and any discoloration of either the alcohol or the plain paper surrounding the print is noted."

*Trade mark. Leaflet supplied on request.

## Use Magazines and Posters To Promote Super Pyro

(*Continued from previous page*)

Dealer prices for Super PYRO will remain the same as 1938—54c a gal. on large drums, 60c on the 5-gal. and 1-gal. cans, and 65c on the quart cans. West of the Rocky Mountains dealer prices are slightly higher and the retail price is $1.20 per gal. or 30c a quart.

U. S. I. continues its policy of consigning stock of Super PYRO to carefully selected distributors whose compensation for selling provide 25% return on 54-gal. and 5-gal. drums, and 24% on gallon and quart cans, on volume exceeding 4,000 gallons.

## *Find How To Make Dye For New Aluminum Test*

WASHINGTON, D. C.—The detection and determination of small amounts of aluminum by a recently published method depends upon the use of a uniform high-quality dye, according to World Trade Notes. Finding that a suitable reagent was not available, chemists at the National Bureau of Standards devised a method for the preparation of the ammonium salt of aurintricarboxylic acid. This dye is said to have proved entirely satisfactory in the test for aluminum.

## Alcohol Boosts Yield of Pulp From Cane Bagasse

AMES, IOWA—For increasing yields of pulp from sugar cane bagasse, a solution of nitric acid in ethyl alcohol is undoubtedly a superior pulping medium to aqueous nitric acid, S. I. Aronovsky and D. F. J. Lynch, experimenters in the U. S. Agricultural By-Products Laboratory here, report in *Industrial & Engineering Chemistry*.

They emphasise that ethyl alcohol has a depressing effect on the hydrolytic properties of nitric acid without greatly lessening its pulping or delignifying properties, and report a much greater retention of Cross and Bevan cellulose, alpha-cellulose and pentosans. From the paper-making point of view, as well as for viscose rayon, cellophane, plastics, and lacquer, the alcoholic acid pulp is particularly attractive.

About 30% of the 500,000 tons of bagasse produced yearly is estimated to go into the manufacture of insulating and building boards.

**SOLOX MAKES BOWLERS HAPPY**

**Mergard's in Cincinnati uses the anhydrous grade of U.S.I.'s proprietary solvent exclusively for cutting shellac with which the bowling alleys are finished. Solox is a stronger solvent than ordinary denatured alcohol and has no heavy penetrating odor. Other advantages of Solox are given in a descriptive leaflet available on request.**

### TECHNICAL DEVELOPMENTS

*Further information on these items may be obtained by writing to U.S.I.*

**A special finish for refrigerator ice trays** is said to facilitate release of ice cubes. The new finish is water-white, resists fruit acids, corrosion and cleaning compounds and dries hard in air in one to three minutes, according to the manufacturer. **(No. 131)**

U S I

**Flexible casein,** said to dissolve readily in water without heat, is described as a straw-colored transparent jelly, free from solid particles and having a pleasant odor. The water-solution dries rapidly to give a flexible, almost colorless, transparent film, the manufacturer states. **(No. 132)**

U S I

**A new striping tool** applies paint directly from standard collapsible tubes, according to a recent announcement. Eleven stripe width wheels are available. **(No. 133)**

U S I

**An ink deodorant** with a definite fruity note has been developed for applications where a perfume odor would be objectionable, according to a recent announcement. The manufacturer recommends it for use in inks for paper napkins, doilies, and food wrappers. **(No. 134)**

U S I

**Carboy drainers** designed to prevent accidents caused by splashing and carelessness in pouring are now available in three sizes—5 gallon, standard and large—a recent announcement states. The announcement further states that one user writes that the installation of a Carboy swing or rock ordinarily required by insurance regulations is not necessary when these drainers are used. **(No. 135)**

U S I

**A water soluble solvent** said to be particularly effective in removing fatty matter, soaps, and mineral oils from metal prior to finishing operations has been introduced. Surfaces treated are easily rinsed, free from deposited salts, and are protected from corrosion during short stocking periods, according to the manufacturer. **(No. 136)**

U S I

**New monochromatic filters** for isolating the prominent lines of the mercury spectrum at wave lengths 365, 405, 436, 546, 578 and 1014mu are said to be far superior to any previously available. Exceedingly high transmission can be had with purity factors from 90 to 99%, the manufacturer reports. **(No. 137)**

U S I

**Aluminum when tarnished** may be restored to a mirror finish by a new product which is said to dissolve oxidation and stains, according to a recent announcement. The product is said to work equally well on pewter and silver, gold, platinum, stainless steel, brass, and baked enamel surfaces. **(No. 138)**

U S I

**A surface resembling felt** may now be applied to any plastic by a new process of spraying flock, according to a recent report. The manufacturer points out that the flocking process costs from 30 to 40% less than the felting operation of putting bases on ring boxes and other items, to prevent them from scratching. **(No. 139)**

# U.S. INDUSTRIAL ALCOHOL CO. / U.S. INDUSTRIAL CHEMICAL CO. INC.

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Refined Fusel Oil
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Specially Denatured
Completely Denatured
Anhydrous Denatured
Absolute—Pure
C.P. 96%—Pure and Denatured
Pure (190 Proof)—Taxpaid, Tax Free

*SOLOX—The General Solvent
*SUPER PYRO—The premium Quality Anti-freeze

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**ISOPROPYL ALCOHOL**

**METHYL ALCOHOLS**
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**ACETONE**
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**ETHYL CHLORCARBONATE**
**ETHYL FORMATE**
**ETHYLENE**
**URETHANE**

***CURBAY**
**POTASH BY-PRODUCTS**

*Trade-mark registered

to its too long or too short chain length of molecule, for use for many purposes, while some of the distillation product is characterized by a disagreeable smell and other undesirable properties. The yield of fatty acids suitable for soap-making varies from 50 to 80 per cent. of the crude acids distilled, according to the type of raw material. On the I.G. experimental plant, the separation stages of the process have been worked continuously, but so far the actual oxidation step has been worked discontinuously. Aluminum, iron and, in smaller quantities, special steels have been used as plant constructional materials.

Since 1928, systematic trials on rats and other animals have been carried out with synthetic fats made by the condensation of the synthetic fatty acids and glycerine, the experiments having been intensified since 1936. These experiments so far have produced very encouraging results.

## New Grade of Blasting Agent

Nitramon No. 2, is a new grade of Nitramon blasting agent just announced by du Pont. New grade is said to have all the safety advantages of the regular Nitramon and is to be used in the same way as the regular grade.

## Fine Wave Line Wrinkle Finish

A fine wave line wrinkle finish with glistening silver specks can be produced with finishing materials developed by Hilo Varnish Corp., 44 Stewart Ave., Brooklyn, N. Y. The Sparkle Rip-pl, as it is called, may be used on any non-porous surface. It is well suited for heating and air-conditioning equipment, toys, novelties, etc. Finish is proof against alcohol and grease; it is moisture and oil resistant.

## Flameproofing Compound

Manufacture of a clear, neutral, non-poisonous liquid, called "Ignex," which can be easily applied by dipping or spraying to render all kinds of fabrics flameproof is announced by a New York company. It harms nothing that will not be harmed by water, does not "powder off" and is invisible after being applied. (*Industrial Finishing,* Aug. '38, p. 52).

## Oil Stain for Close-grained Hardwoods

A new type of oil stain, called Nu-Wype, is said to impart great depth of color, uniform penetration, and is remarkable for its ease of application. It is particularly adaptable for use on close-grained hardwoods such as gum, poplar, basswood, maple, etc. Manufacturer is Reliance Varnish Co., Louisville, Ky.

## Wood Primer and Filler

Development of a new product called Nuoil Filler is announced by V. J. Dolan & Co., Chicago, manufacturers of wood-finishing supplies. Company is convinced that these fillers will eliminate quick-setting and hard-cleaning, which some finishers are complaining about. It is also claimed that filling costs can be greatly reduced and that results can be improved through the use of Nuoil.

## Dull Varnish for Furniture Industry

A dull varnish for the furniture industry is being made by Marietta Paint & Color Co., Marietta, O. Manufacturer claims it will not fade away after application for it maintains its "high solids appearance." "Varmaco" dries dust free in 45 minutes to one hour and permits application of a heavy wet coat without sagging, making possible a satisfactory depth of finish with one coat of a suitable sealer. Finish is unharmed by a severe alcohol and water condition, and offers unusual resistance to abrasion and hard wear.

## New Mineral Blacks

Four new products belonging to the mineral black category have been added to the line of blacks featured by Binney & Smith, New York City. They are described as "calcined and processed carbon bearing ores." Tests indicate that one of the four (Minralex Black No. 15) mixes with rubber in a perfectly satisfactory manner, acting as an inert filler of low reinforcing power. As a class, the new blacks are in the very low oil absorption range, having approximately one-tenth that of an ordinary grade of carbon black. They also have comparatively low tinting strength value, the highest grade having only about one-seventh the tinting value of an ordinary grade of carbon black. Their pH values range between 5.5 and 5.7. Minralex Black No. 15 has a fineness of 98.5% through a 325 mesh screen. The specific gravity of the blacks ranges from 2.50 to 2.68, the carbon content between 20.7 and 10.5, and the ash content from 79.3 up to 89.5. (*Rubber Age,* Aug., '38.)

## Latex Adhesives

A line of latex adhesives, called Duntex, is being made by Robt. G. Moore, 1341 So. Hope St., Los Angeles, Calif. One of these, Duntex-101, is described as a fluid latex cement for use where a high degree of elasticity and flexibility is required in the bond, and is said to be suitable for leather, cloth, paper, pasteboard, etc. Another, Duntex-105, is recommended for cementing asphalt tile, rubber tile, wall board, plastic sheeting, etc.

## Latex in Ceramics

Latex can be successfully used in the manufacture of thin-walled china, porcelain, and other ceramic pottery, according to U.S.P. 2,121,018 recently granted to Mitchell Carter and Gustav Heinz of Trenton, N. J. Used as a binder, latex reduces the amount of clay normally required for manufacturing such ceramic material. In the production of thin-walled vases it acts as a stiffening agent, preventing collapse and distortion of the plastic mass prior to hardening. According to the patent, the latex is mixed in with the ingredients, the percentage being one part latex to ten parts of the mix; the formed pottery is then placed in the firing oven; and the latex is burned out when the heat hardens the ware into its final form. (*Rubber Age,* Aug., '38).

## Methacrylate Base Finishes

A line of clear finishes for industrial use is being manufactured by du Pont's Finishes Division. New finishes have a methacrylate base and afford unusual adhesion and flexibility over bare, non-ferrous metals such as aluminum, chromium and brass. They deposit a glossy, water-white film which dries rapidly by evaporation. The coating is hard and non-yellowing, resistant to acids, alkalies and alcohol. It has demonstrated satisfactory durability under outdoor exposure.

## Cellulose Triacetate

Eastman Cellulose Triacetate Type No. TA-44 is now being produced by Tennessee Eastman Corp., Kingport, Tenn., in commercial quantities. Material has excellent stability to heat and to the action of boiling water. It has greater resistance to moisture absorption than any of the more hydrolyzed types of cellulose acetate.

## Moisture-proof Paper Lacquer

A new moisture-proof paper lacquer just announced by du Pont, has been designed primarily for use on packages, and affords a protective film which is impermeable to water vapor. Its purpose is to prevent moisture from entering into packaged goods which should be kept dry, and similarly to retain the desired quantity of moisture in those which should be moist. Lacquer adds brilliance to colors on labels, and prevents off-setting and smearing of inks on labels of products which must be packaged while hot.

# Chemical Specialties for Industry

***A digest of new uses and new compounds***

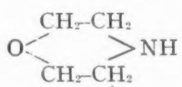
## Water-resistant Polishes

***By H. F. Robertson and A. L. Wilson****

IN most film-forming industrial emulsions, such as those used in "rubless" polishes, paper coatings, leather dressings, and also paint, asphalt, and sizing emulsions, it is desirable that the film be resistant to water after drying; that is, it should not be hygroscopic, spotted, nor removed by water. Many commercial emulsifying agents are non-volatile and stable compounds which have a tendency to re-emulsify the film if it is subsequently wetted. Attempts to increase water resistance through such non-volatile emulsifying agents have meant either a decrease in the concentration, or the use of less effective emulsifying materials, with consequent damage to emulsion stability or film brightness.

The organic amine, morpholine, which has recently become commercially available, is strongly basic and combines with fatty acids to form soaps. These morpholine soaps, such as the oleate and stearate, have made possible the preparation of emulsions of excellent stability that dry to films of superior water resistance.

Morpholine is a colorless, mobile liquid with an ammoniacal odor which is greatly diminished upon dilution with water. It is a pure chemical compound of formula



It has a specific gravity of 1.001 at 20/20° C. Though it boils at 128.3° C., morpholine is unusual in that it has a volatility approaching that of water. (1). Moreover, aqueous morpholine solutions evaporate with little change in composition and with the maintenance of a constant alkalinity. This volatility, characteristic of morpholine, together with the hydrolyzing tendency of its fatty acid soaps, determines the behavior of its emulsions during the process of drying. Sufficient morpholine is found to remain in the film during the first stages of drying to yield a bright deposit. During the final stages the amine is almost completely vaporized with the water to leave a film resistant to subsequent water treatments.

As morpholine does not evaporate selectively from its water solutions, there is no boil-off loss in making emulsions at the elevated temperatures of 80-95° C. used in wax-emulsion technics. In addition, it is not lost from emulsions standing in open containers.

Emulsions prepared with morpholine are also distinguished by their stability and small particle size. The oil-in-water type is ordinarily resistant to "breaking" if the particle size averages four microns or less. In a microscopic examination of a group of morpholine polishes, most of the particles averaged under one micron (0.0001 cm.) in diameter with only a few as high as six microns. The gloss of a dried wax film, other things being equal, is dependent upon the particle size of the emulsion. Coarser emulsions yield comparatively dull surface coatings, while very fine wax dispersions produce films of high gloss.

Various automobile, floor, leather, and furniture polishes are readily produced with morpholine soaps. A carnauba wax emulsion which may be prepared as a translucent, almost water-clear solution is typical. This polish, on spreading evenly over a surface, evaporates to a film of high brilliance without rubbing.

The following method of carnauba wax emulsification is recommended for the production of a smooth and stable dispersion. Because of the possible variation in composition of the commercial ingredients and the varying conditions which may attend the compounding, modification of the formula to meet individual requirements may be necessary. The given formula, however, can serve as a useful basis for experimental work. The choice of a good grade of carnauba wax and close attention to the details of preparation are essential.

| | lb. |
|---|---|
| Carnauba wax | 11.2 |
| Oleic acid | 2.4 |
| Morpholine | 2.2 |
| Water | 67.0 |

Melt the carnauba wax carefully with the oleic acid in a hot water or steam bath and maintain the temperature closely at 85-90° C. Stir until well mixed, slowly add the morpholine, and stir constantly until the whole mass is quite clear. In the meantime, the water should have been brought to the boiling point in a separate kettle. Add it slowly, in very small portions, to the hot wax mixture, with steady stirring, making certain that each small portion is well incorporated before a further addition. During this addition the mixture becomes increasingly viscous and, when about two-thirds of the water has been added, it has the appearance of petrolatum. At this point, the emulsion reverts from a water-in-oil to an oil-in-water dispersion and, as it becomes thin and soapy, the remainder of the water may be added rapidly. The total time for adding the water should be about 30 minutes. While slowly stirring, allow the mixture to cool.

Control of temperature is important. Close to 90° C. has been found most successful. The addition of water to the mixture may be made too slowly as well as too rapidly.

The addition to the carnauba emulsion of a water solution of one of the group of alkali-soluble resins is indicated for most applications. This procedure has been found to produce certain beneficial effects on the film, notably increasing its wetting action on surfaces to be covered and improving flow-out and leveling characteristics. From 10-15 per cent. of such resin, based on the weight of the carnauba wax, is usually employed. Typical formulations would be as follows:

| | lb. | | lb. | | lb. |
|---|---|---|---|---|---|
| Manila resin | 1.5 | Shellac | 1.5 | Rosin | 1.5 |
| Morpholine | 0.6 | Morpholine | 0.2 | Morpholine | 0.6 |
| Water | 15.1 | Water | 15.5 | Water | 15.1 |

Procedure for forming these solutions varies with the resin. Manila or pontianac resins are used preferably in powdered form, so that they may be dissolved more readily. Their solubility increases with aging. Mix the morpholine thoroughly with the Manila or pontianac to obtain a viscous, gummy mass. Cover with about two pounds of the water and allow to stand for an hour or overnight. Next, stir until homogeneous and add the remaining water in small portions. This procedure should give a clear solution from which any small amount of undissolved resin can be filtered or decanted.

* Mellon Institute.

This is the second in a series of two advertisements on Vanillin Monsanto.

# A DECADE OF PROGRESS!

Ten years ago, Monsanto introduced to America a new high standard of Vanillin, produced from the basic elements of carbon, hydrogen and oxygen.

Today, after a decade of progress in its improvement, America is no longer dependent upon foreign sources for the rare materials formerly used in the production of this pure and wholesome flavor. Instead, a continual domestic supply, the price of which has steadily declined during this period, is ready to meet the increasing demand. And Vanillin Monsanto is but one example of many in which Monsanto's research chemists have helped to contribute highest standards while constantly lowering costs.

Vanillin Monsanto, skillfully processed from the raw ingredients of nature, is a crowning culmination of man's ability to formulate quality products. It is manufactured in modern equipment under exact scientific control to insure its high degree of purity, true aroma and uniform flavor. Our productive facilities are so large that they are easily capable of caring for the nation's entire requirements.

The results of thirty years of concentrated effort by specialized technicians in the formulation and improvement of a quality Vanillin are *yours for the asking!* We solicit your inquiries for this and other Monsanto products.

VANILLIN MONSANTO,

produced by the world's largest manufacturer of Vanillin, is the first choice of discriminating buyers because it adds to the salability of their products.

**Monsanto Chemical Company**
St. Louis, U.S.A.

In the case of shellac, only fresh material dissolves with ease. The best procedure consists in heating the entire resin formulation together and maintaining the temperature just below the boiling point for about one hour. Under occasional stirring, the major part of the shellac will dissolve and the solution may be decanted from solid impurities. Finally, in the case of resin, melt the resin over a steam bath and stir in the morpholine until the mixture is homogeneous. While maintaining the temperature near the boiling point, slowly add the water with constant stirring. A clear and practically complete solution can thus be obtained. In all these resin formulations, it is possible to substitute an equal weight of aqua ammonia for the morpholine with slight loss in effectiveness and ease of manipulation.

A finished polish is formed by adding one of the given resin solutions to the previously prepared carnauba wax emulsion. Filtering or decanting the mixture from impurities or unincorporated wax or resin is usually desirable. Of the given resins, rosin is the most effective in reducing streaking in the drying polish film, but is not to be recommended for polishes applied to rubber or linoleum. Manila type resins are only slightly less effective, but they are less readily dissolved than the shellac. For use on unfinished wood and composition paneling, where the surfaces are somewhat absorbent, an increase in the solids content with subsequent increase in viscosity and film thickness is advisable. This improvement may be accomplished by reducing the water content of the carnauba wax emulsion up to one-third, as well as by a further slight reduction of the water content of the appropriate resin solution. In this way, the concentration of film-forming ingredients in the polish may be raised from the given 15 per cent. to about 20 per cent.

Another morpholine formula uses the less expensive paraffin wax in the place of most of the carnauba wax. This polish does not dry bright, but can be buffed to a good luster. It is prepared as follows:

| | Parts by Weight |
|---|---|
| Carnauba wax | 2.6 |
| Paraffin wax | 10.6 |
| Oleic acid | 3.0 |
| Morpholine | 2.6 |
| Water | 100.0 |

Weigh out and mix the oleic acid, morpholine, and water, and heat the mixture in a kettle to 100° C. After the solution is boiling gently, stir carefully until the soap (formed by the reaction of the morpholine with the oleic acid) is dissolved, so that a smooth solution is obtained with a minimum of foam. In a separate steam-heated container melt the carnauba and paraffin waxes until a temperature of 85 to 90° C. is reached. Do not allow the temperature to rise above 90° C. or the waxes will darken in color. Now add the molten wax to the boiling soap solution and stir vigorously until an even dispersion of the wax results. Then stir gently, but continuously, until the emulsion has cooled to room temperature.

### Water-resistant Characteristics

The water resistance of polish films may be shown qualitatively by the extent of the spotting or disintegrating action of water on prolonged contact. An excellent quantitative technic seems to lie in the measurement of water repellency of the film at the time of initial contact. The experimental procedure consists in measuring the contact angles between the surface of the water and the solid-liquid interface by the tilting plate method (2). Zero angle of contact indicates complete wetting of the solid; a completely water-repellent surface would have a contact angle of 180°. The water resistance of films produced by the drying of emulsions made with morpholine soaps is evidenced by their having contact angles as great as 80°, compared to 20° to 30° for polishes made from non-volatile emulsifiers. The degree of moisture impermeability of the polish films is also important. This property is determined by measuring the water-vapor transmission rate of wax film coating laid down on thin, dense paper. The results of such tests demonstrate that the wax films prepared with morpholine soaps have 50 to 65 per cent. lower transmission rates than films made with fixed soaps.

As in the case when any volatile organic solvent is used, adequate ventilation should be provided when morpholine polishes are manufactured. This is especially true during that part of the manufacturing step in which the polish is warm, and hence the concentration of morpholine vapor in the air is increased correspondingly.

**References**

(1) Wilson, A. L., *Ind. Eng. Chem.*, *27*, 870 (1935).
(2) Wenzel, R. N., *Ibid.*, *28*, 988 (1936).

## Low-cost Emulsifying Agent

Beacosope A, an extremely powerful low-cost emulsifying agent, which is adaptable for use in cutting oils, disinfectants, insecticides, animal dips, cattle sprays, metal polishes, laundry soaps, floor scrubs, dry cleaning soaps, soluble oils, textile specialties, paraffin wax, coal tar oil, cresylic acid, and various other emulsions is announced by Beacon Co., 89 Bickford St., Boston, Mass. Due to its powerful coupling action, great efficiency and low cost, product is of special advantage for large scale emulsification. Following are specifications:

| | |
|---|---|
| Moisture | ½-1% |
| Unsaponifiable Matter (Mineral Oil) | 45-50% |
| Dry Soaps | 40-45% |
| Ash | 5-10% |
| Free Fatty Acid | Trace |
| Free Alkali as NaOH | None |

## Delustering Agent

A delustering agent, Fractol A, for application to fabrics or hosiery to give a dull finish more permanent than hitherto obtainable, save by dulling during the course of manufacture, is being made by Imperial Chemical Industries, London, Eng. *Dyer and Textile Printer*, July 29, '38, p. 64, describes it as a fine dispersion of a white pigment, and weakly acid in reaction. The finish is very resistant to washing or dry cleaning with white spirit or trichlorethylene, and is not liable to "dust" when the fabric is shaken or during wear.

## Rust Preventive

Benzyl cellulose which is practically unaffected by water (e.g., which shows little capacity for swelling against caustic alkalis and $NH_4OH$ at ordinary temperature) is also little affected by most acids. It softens at 100 deg. very slightly, but does not decompose below 180 deg. It is elastic and less brittle than cellulose acetate films. Its electrical properties are excellent and it is resistant to light. It is peptized by cheap solvents. Resins may be introduced with good results, and the films of benzyl cellulose adhere well to most metallic surfaces. H. Kalkers, *Rdsch. tech. Arb.* 17, No. 9 (1937) through *Papier-Fabr.* 36 (Abstracts) 79-80 (1938).

## New Fatty Acid Soaps

S. A. Laurate and S. A. Stearate are two new super-ammoniated fatty acid soaps recently made available for special uses. Products are water dispersible and, when applied, dry readily to give water repellent films of good lubricating value. They are excellent emulsifying agents which give emulsions whose films do not re-emulsify after drying. In addition, they have excellent detergent properties and frothing power. These properties are applicable in coating, filling, cleaning, lubricating, insulating and polishing paper, textiles, rubber, leather, metals, wood, ceramics and numerous other products, and also for waterproofing concrete, cement and stucco. Besides being "soluble" in water, they dissolve in alcohol. Manufacturer is Glyco Products Co., 148 Lafayette St., N. Y. C.

# New Trade Marks of the Month

LAUXEIN

ATLAS
398,114

sport-grip
403,279

CARTERS RUST PREVENTIVE
404,709

SELF BONDING
375,255

CeloRez
398,165

399,852

INTERNATIONAL LUBRICATION
QUALITY I SERVICE L C
393,957

PERMATEX
TOON-OYL
398,170

CHARM-WITE
400,216

ADCO
400,676

MOGUL
404,010

TEX-ITE
404,785

PATRONAGE
405,244

LOR-EL
396,180

Ford
399,182

NACLAY
400,694

Pe-tre-no Minit
404,628

Plyosyn
404,636

A BEAR FOR WEAR
405,476

Z
399,353

ROSE-X
401,318

ENDURANCE
405,498

KAR-B-OUT
396,751

Spra-Rite
404,637

SUNLUBE
405,530

Hulco Compound
394,050

ZIZZ
408,189

RONAMEL
402,827

AURAGREEN
397,367

HPC Sticker
408,101

U-SEE
405,533

**375,255.** I. F. Laucks, Inc., Seattle, Wash.; Feb. 26, '36; glue; use since June 19, '35.

**393,957.** International Lubricant Corp., New Orleans, La.; June 11, '37; lubricating oils and greases; use since Mar. 1, '37.

**396,180.** Max W. Campbell (Lorel Scientific Essential Labs.), Maywood, Calif.; Aug. 9, '37; mechanics' soap; use since Dec., '31.

**396,751.** Shaler Co., Waupun, Wis.; Aug. 25, '37; motor gum solvent; use since Apr. 1, '37.

**394,050.** Pure Oil Co., Chicago; June 14, '37; protective coating for metallic bodies such as pipe lines, tanks, etc.; use since Sept. 10, '35.

**397,367.** Mallinckrodt Chem. Wks., St. Louis; Sept. 13, '37; dye preparation for application to grass for brown patch control; use since Mar. 2, '37.

**398,114.** H. Kohnstamm & Co., N. Y. City; Oct. 4, '37; pigment and lake colors for general manufacturing; use since 1882.

**398,165.** I. F. Laucks, Inc., Seattle, Wash.; Oct. 5, '37; paints, varnishes, stains, and lacquers, all having an adhesive material therein to increase adhesive tendency; use since Sept. 24, '37.

**398,170.** Permatex Co., Brooklyn, N. Y.; Oct. 5, '37; lubricating oil for degumming, decarbonizing and prevention of formation of sludge in the interior working parts of internal combustion engines; use since Mar. 22, '37.

**399,182.** Ford Motor Co., Dearborn, Mich.; Nov. 1, '37; anti-freeze alcohols and liquids; use since Sept. 10, '36.

**399,353.** Great Western Electro Chem. Co., San Francisco; Nov. 5, '37; sodium ethyl, potassium ethyl, potassium butyl, potassium amyl, potassium secondary butyl, potassium pentasol, and potassium isopropyl xanthates; earliest use since 1923.

**408,189.** Gus H. French (French Labs.), Minneapolis, Minn.; July 5, '38; mosquito repellent and insecticide; use since Apr. 27, '38.

**399,852.** H. A. Montgomery Co.; Detroit, Mich.; Nov. 17, '37; lubricants, particularly for treating lubricating oils to increase penetrating qualities and reduce effects of temperature changes; use since July 9, '37.

**400,216.** Wm. Wolf, Newark, N. J.; Nov. 27, '37; shoe cleaning fluid, polish and white shoe fluid; use since Apr. 12, '37.

**400,676.** American Disinfecting Co., Sedalia, Mo.; Dec. 10, '37; alkaline detergents, filter soap, liquid garment stain and spot removers, etc.; use since 1925.

**400,694.** Illinois Clay Prods. Co., Joliet, Ill.; Dec. 10, '37; treated clay used in preparation of fluids used in drilling wells, etc.; use since May 15, '37.

**401,318.** Roselux Chem. Co., N. Y. City; Dec. 28, '37; liquid waxing compounds; use since Dec. 15, '36.

**402,827.** T. J. Ronan & Co., N. Y. City; Feb. 8, '38; paint enamels, an undercoating and a thinner; use since Oct. 20, '22.

**408,101.** Hercules Powder Co.; Wilmington, Del.; July 1, '38; compounds for insecticides and fungicides; use since June 24, '38.

**403,279.** Irving J. Siegal (Sport-Grip Mfg. Co.), Chicago; Feb. 21, '38; material for application to hands or implement used in playing cards, which provides a film or coating that absorbs perspiration and gives a non-slipping hold; use since Nov. 10, '37.

**404,010.** North American Fibre Prods. Co., Cleveland, O.; Mar. 12, '38; compound for elimination and prevention of rust, scale corrosion, and congestion in boilers, and similar applications in which water and/or steam are used; use since Jan. 1, '37.

**404,628.** Pete Biondo, St. Louis, Mo.; Mar. 30, '38; cleaner for stoves, silverware, nickel plated articles, etc.; use since Jan. 1, '38.

**404,636.** Leon Finch, Ltd., Los Angeles, Calif.; Mar. 30, '38; synthetic enamels for metallic and other surfaces; use since Apr. 1, '37.

**404,637.** Leon Finch, Ltd., Los Angeles, Calif.; Mar. 30, '38; synthetic enamels for automotive and industrial work; use since Apr. 1, '37.

**404,709.** Louis M. Greene (Carter Mfg. Co.), Cleveland, O.; Mar. 31, '38; composition for prevention rust and corrosion on metallic surfaces; use since Mar. 1, '36.

**404,785.** Tex-ite Prods. Corp., Brooklyn, N. Y.; Apr. 1, '38; cleaning, cleansing and detergent preparations for household and industrial use; use since Sept. 1, '26.

**405,244.** Friesche Cooperative Zuivel-Export-Vereeniging, Leeuwarden, Netherlands; Apr. 14, '38; casein; use since Nov. '25.

**405,476.** W. H. Barber Co., Minneapolis, Minn.; Apr. 20, '38; lubricating oils and greases; use since Apr. 13, '38.

**405,498.** Glidden Co., Cleveland, O.; Apr. 20, '38; paints, enamels, stains, wood fillers, and varnishes; use since Aug. 15, 1911.

**405,530.** Sunset Oil Co., Los Angeles, Calif.; Apr. 20, '38; motor fuel oils; use since Jan., '36.

**405,533.** United Chemical Co., Kansas City, Mo.; Apr. 20, '38; preparation for cleaning and polishing windows; use since Mar., '37.

† Trade-marks reproduced and described cover those appearing in the *U. S. Patent Gazettes*, July 26 through week August 16, inclusive.

## Leather Adhesives

Polymerization products of acids of the type crotylidene cyanacetic acid or derivatives thereof, such as esters, are used as adhesives. Known adhesives, additional materials, filling materials, softeners, solvents, or emulsion-forming agents may also be present. The adhesion may be effected with solutions, dry films or powder, or the polymerization and adhesion may be effected in one operation. In examples, polymers of butyl crotylidene cyanacetate dissolved in ethyl acetate, ethyl acetate and nitrocellulose, butyl crotylidene cyanacetate and triethanolamine, are used as cements for leather. Subject is basis of E. P. 482,292, mentioned in *Chemical Trade Journal*, June 24, '38, p 544.

# New Organic Oxides

. . . non-flammable, almost odorless ethers or ether-alcohols. Most of them are soluble both in water and in hydrocarbons; hence are excellent mutual solvents. Being extremely stable, they serve as high-boiling, inert reaction media. The following new, slow-evaporating liquids are powerful solvents for dyes, inks, and resins.

---

## METHYL "CARBITOL"

$CH_3OC_2H_4OC_2H_4OH$

. . . the lowest boiling (193.2°C.) ether of diethylene glycol . . . is completely soluble in water and, being the first member of a homologous series, it possesses some singular properties as a solvent, especially for dyestuffs. It can be employed in wood stains and textile dye pastes in the same manner as "Carbitol." Its primary alcohol group can be changed to an aldehyde or acid radical and makes possible industrially interesting esters, ethers, halides, and amides.

## DIMETHOXYTETRAGLYCOL

$(CH_3OC_2H_4OC_2H_4)_2O$

. . . a stable, water-white liquid with a boiling point of 275.8°C. . . . is the dimethyl ether of tetraethylene glycol. Although it consists entirely of hydrocarbon and ether groups, it is completely soluble in water. The presence of five ether groups in its molecule indicates a high solvent power. Its low volatility suggests its use as a plasticizer, while its chemical inertness makes it suitable as a neutral reaction medium.

## DIBUTYL ETHER

$C_4H_9OC_4H_9$

. . . a colorless liquid boiling at 142.6°C. . . . has a flash point of 100°F. The presence of two butyl groups assures a high solvent power for many complex hydrocarbons and fatty materials. Its solubility in water is only 4 per cent of that of ethyl ether, which makes it an economical extracting agent for treating aqueous systems. Other advantages for extraction processes are its stability, ease of recovery, and decreased fire hazard. The low solubility of water in this ether makes it a convenient medium for reactions such as the Grignard which require a strictly anhydrous ethereal vehicle. It also forms numerous constant-boiling mixtures which make it useful for purifying other solvents.

## DIETHYL "CARBITOL"

$(C_2H_5OC_2H_4)_2O$

. . . a colorless, almost odorless liquid . . . boils at 186.0°C. Its slow evaporation rate and high solvent power for nitrocellulose and resins indicate its use as a high-boiler in brushing lacquers. When added to colloidal systems, such as detergents and wetting agents of limited water solubility, it permits dilution with water without gelling or clouding. Since it is composed entirely of ether and hydrocarbon groups, it is chemically inert and makes an excellent high-boiling reaction medium.

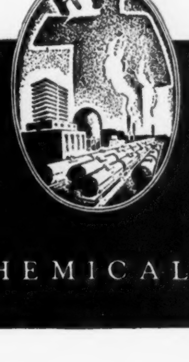
## PHENYL "CELLOSOLVE"

$C_6H_5OC_2H_4OH$

. . . a water-white liquid with a faint aromatic odor . . . boils at 245.2°C. Since it is partially soluble in water and contains both the ethanol and phenyl groups, it will dissolve a host of diverse materials. Being almost odorless, it is effective as a fixative for delicate perfumes in soaps and cosmetics, where its high alcohol solubility is an advantage. It is stable in the presence of acids and alkalies, remains colorless, and does not become rancid. Its alcohol group makes it a potential intermediate for the synthesis of plasticizers, germicides, and pharmaceuticals.

*Further information will be gladly furnished on your request.*

The words "Carbitol" and "Cellosolve" are registered trade-marks.



CARBIDE AND CARBON CHEMICALS CORPORATION

*Unit of Union Carbide and Carbon Corporation*

UCC

30 East 42nd Street, New York, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

MOTOR FIZIK
405,594

EATS EVERYTHING IN THE PIPE
CANNIBAL
405,624

Arwell
MOTH MAGIC
405,628

NATIONAL HARD-WEAR WAX
406,123

SORBAN
406,170

CLOTRACIDE
407,897

HYMOLIT
407,902

SURFAX
406,292

All-Weather LAMINEX
406,316

ETCHADINE
406,340

EXTERMITAL
406,407

ING
406,540

Solve-X
406,591

GRIZZLY
406,628

JEWEL
406,642

TINT-O-LITE
406,678

MICROBEX
406,688

Perbunan
406,718

LEDATE
406,789

STAYCAL
406,888

KOSMETEX
406,937

Supersour
406,938

COPROTE
406,969

LEADERINE
407,016

Rigolene
407,070

Toilex
407,159

L&K
407,226

COSMIC - RAY
407,243

O.K.
407,326

BLENDSOL
407,394

Ak-Ro-No
407,410

KAR-NEET
407,518

NUFF-SAID
407,542

HUDSON OIL CO.
TRANSPORT GASOLINE
407,550

RHOTEX
407,562

Ferret
407,600

PAMPHLEX
407,696

KROMEWELD
407,841

ROBSOCO
407,883

**405,594.** Curran Corp. (Belmont Co.), Malden, Mass.; Apr. 22, '38; lubricating oil; use since Oct., '35.

**405,624.** John Sunshine Chem. Co., Chicago; Apr. 22, '38; drain pipe cleaner; use since Feb. 16, '33.

**405,628.** Arwell, Inc., Waukegan, Ill.; Apr. 23, '38; cleansing, deodorizing, and fumigating preparation; use since Mar. 1, '38.

**406,123.** Donald Durham Co., Des Moines, Iowa; May 9, '38; wax—all types—for floors, furniture and automobiles, etc.; use since Mar. 30, '38.

**406,170.** Atlas Powder Co., Wilmington, Del.; May 10, '38; sorbitol syrups; use since Apr. 6, '38.

**407,897.** Cloverset Flower Farm, Kansas City, Mo.; June 25, '38; insecticides; use since Jan. 2, '37.

**407,902.** Hart Prods. Corp.; N. Y. City; June 25, '38; wetting and moistening preparations, finishing — smoothing — tanning — thread and fibre penetrating—and thread and fibres protecting preparations; use since Jan. 30, '36.

**406,292.** E. F. Houghton & Co., Phila., Pa.; May 13, '38; textile wetting out agents; use since May 2, '38.

**406,316.** Wheeler Osgood Sales Corp., Tacoma, Wash.; May 13, '38; resin bonded plywood; use since Nov., '37.

**406,340.** Paul H. Jamieson (Jamieson Prods. Co.), Redondo Beach, Calif.; May 14, '38; compounds used in photographic pictorial control; use since Nov. 16, '34.

**406,407.** Westerfield Pharmacal Co. (Extermital Chem. Co.), Dayton, O.; May 16, '38; insecticides; use since Mar., '37.

**406,540.** Chester J. Stebenne, Denver, Colo.; May 19, '38; automobile cleaning and polishing preparations; use since Apr. 25, '38.

**406,591.** Martin-Senour Co., Cleveland, O.; May 21, '38; paint solvents, reducers and extenders; use since May 4, '38.

**406,628.** W. H. Barber Co., Minneapolis, Minn.; May 23, '38; lubricating oils and greases; use since Apr. 14, '38.

**406,642.** Globe Roofing Prods. Co.; Chicago; May 23, '38; asphalt composition roofing and building papers; use since Mar. 1, '37.

**406,678.** H. B. Davis Co., Balto., Md.; May 24, '38; paints and enamels for interior uses; use since Feb. 15, '38.

**406,688.** Mathieson Alkali Works Inc., N. Y. City; May 24, '38; bactericide, germicide, deodorant, insecticide, and fungicide; use since Mar. 17, '38.

**406,718.** I. G. Frankfort-am-Main, Germany; May 25, '38; synthetic rubber; use since July 30, '37.

**406,789.** R. T. Vanderbilt Co., N. Y. City; May 26, '38; lead dimethyldithiocarbamate to be activated with litharge and used as an ultra accelerator in manufacture rubber products; use since Apr. 28, '38.

**406,888.** A. E. Staley Mfg. Co., Decatur, Ill.; May 28, '38; thin boiling starch; use since July 29, '31.

**406,937.** Patek & Co., San Francisco; May 31, '38; compound for removing cosmetics from fabrics; use since May 16, '38.

**406,938.** Patek & Co., San Francisco; May 31, '38; neutralizing agent for neutralizing alkalinity; use since June 1, '37.

**406,969.** General Chemical Co., N. Y. City; June 1, '38; insecticides and fungicides; use since May 11, '38.

**407,016.** Jack P. Eddy (Hynes Equipment Co.), Los Angeles, Calif.; June 2, '38; compound for preserving gut leaders for fish lines, tennis racquettes, etc.; use since Mar. 23, '38.

**407,070.** John Henry Miller, Inc., N. Y. City; June 3, '38; mineral oil; use since Mar. 11, '36.

**407,159.** Purex Corp., Ltd., South Gate, Calif.; June 6, '38; drain opener and toilet bowl cleanser; use since May 17, '38.

**407,226.** Lanman & Kemp-Barclay & Co., N. Y. City; June 8, '38; soap; use since June, '23.

**407,243.** Ray T. Parfet (Cosmic-Ray Enterprises), Kalamazoo, Mich.; June 8, '38; motor oil; use since May 25, '38.

**407,326.** Procter & Gamble Co., Cincinnati, O.; June 10, '38; washing powder; use since 1860.

**407,394.** R. R. Street & Co., Chicago, Ill.; June 11, '38; dry cleaning compound; use since Feb. 27, '36.

**407,410.** Ak-Ro-No Auto Prods. Co., Vandalia, Ill.; June 13, '38; preparation for cleaning and restoring lustre to rubber and rubber products; use since Feb. 1, '37.

**407,518.** Anson Ball (Paramount Prods. Co.), Dover, N. J.; June 16, '38; automobile polish; use since May 21, '38.

**407,542.** Henry C. Greenwald, Madison, Wis.; June 16, '38; lubricating oil compound; use since May 2, '38.

**407,550.** Hudson Oil Co., Kansas City, Mo.; June 16, '38; gasoline; use since Apr. 1, '34.

**407,562.** Rohm & Haas Co., Phila., Pa.; June 16, '38; water soluble resinous materials for sizing or finishing textiles and paper and as thickening agents for aqueous dispersions; use since May 27, '38.

**407,600.** Milo F. Miller (Gas-Gun Mfg. Co.), Kansas City, Mo.; June 17, '38; rat poison; use since Mar. 3, '37.

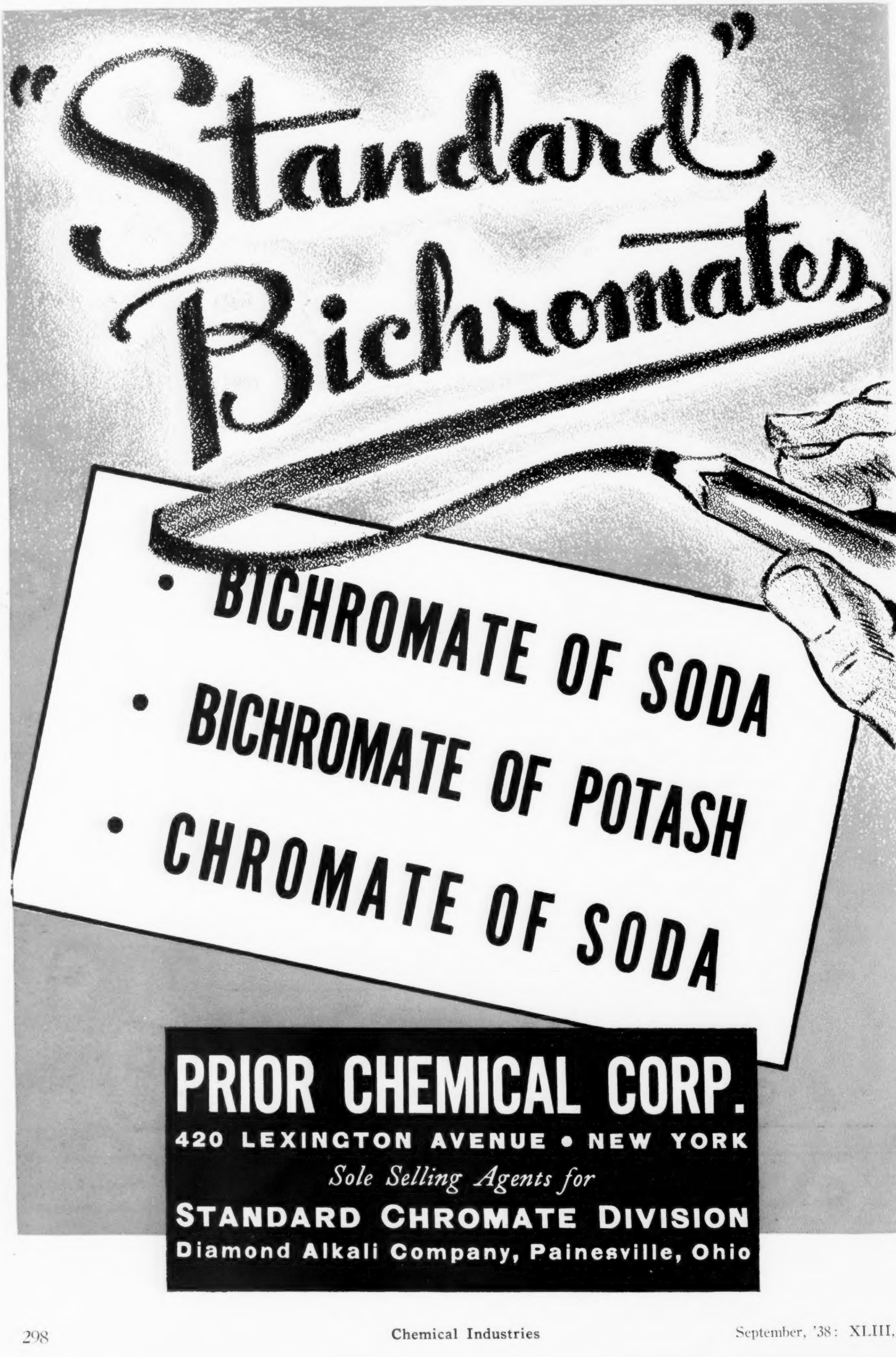
**407,696.** Swift & Co., Chicago; June 20, '38; glue; use since June 1, '38.

**407,841.** Air Reduction Sales Co., N. Y. City; June 24, '38; welding flux; use since June 7, '38.

**407,883.** Robeson Process Co., N. Y. City; June 24, '38; tanning extracts; use since June 15, '38.

## New Dyestuffs

Two new textile dyestuffs have been developed by du Pont. "Pontamine" Fast Turquoise 8GL, a direct color, is primarily of interest for its brilliant, greenish blue shades, which are more brilliant and much faster to light than those obtained with basic colors. "Ponsol" Blue GCL Paste, the latest anthraquinone vat color, is of special interest for bright, greenish blue shades on cotton and for its exceptional fastness to laundering with chlorine.


"Standard" Bichromates
• BICHROMATE OF SODA
• BICHROMATE OF POTASH
• CHROMATE OF SODA
PRIOR CHEMICAL CORP.
420 LEXINGTON AVENUE • NEW YORK
Sole Selling Agents for
STANDARD CHROMATE DIVISION
Diamond Alkali Company, Painesville, Ohio

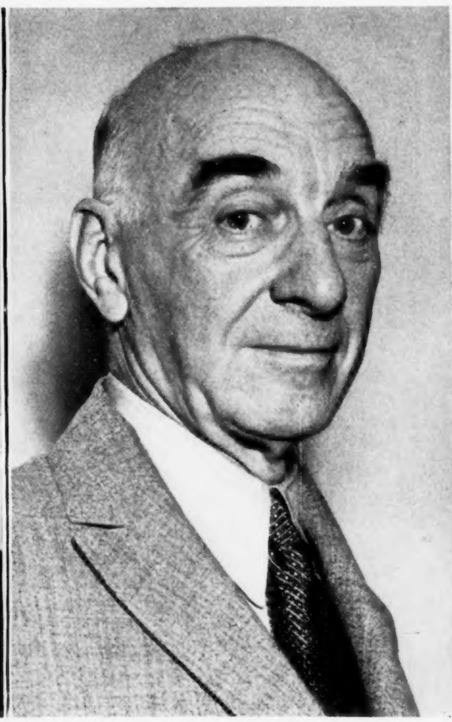
# Names in the News

John Sunshine, president, John Sunshine Chemical Co., Chicago, enjoys the sunshine somewhere in the southwest desert country, during his recent trip throughout the west in his '38 Buick.

Willis H. Doe of Doe & Ingalls, Everett, Mass., chemical distributors, recently returned from a vacation to Hawaii.

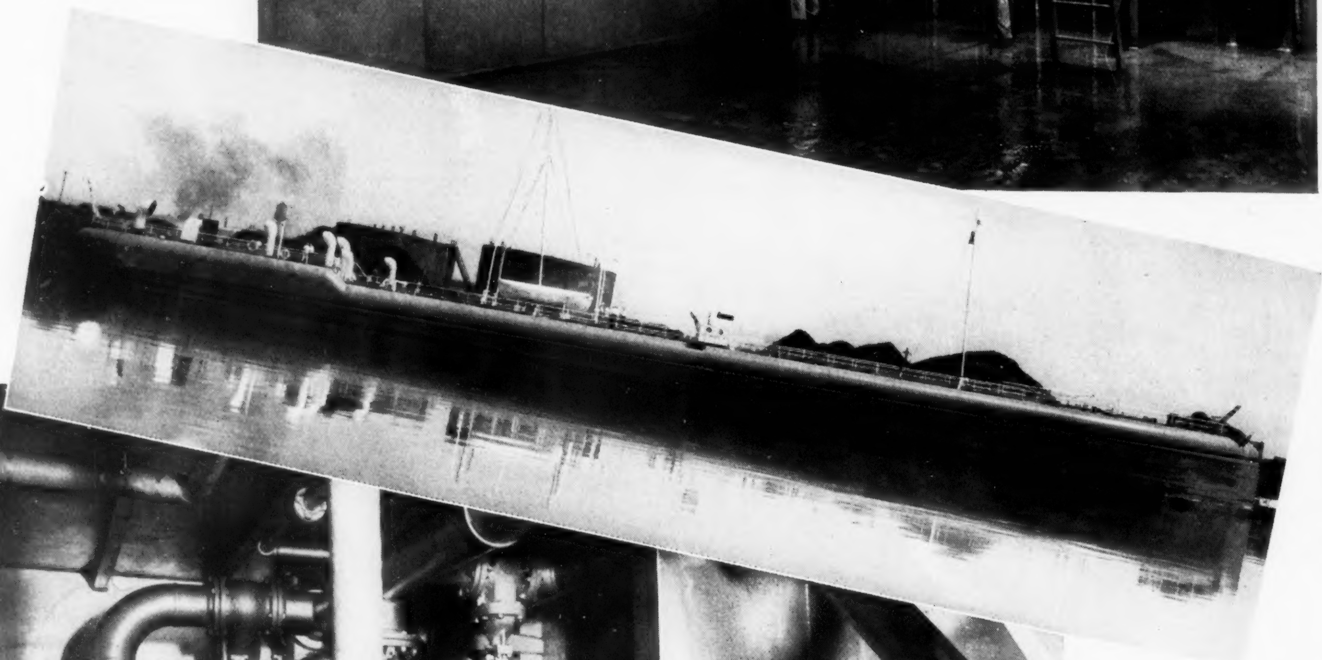
Alvah H. Pierce, who celebrates his twentieth year in the dyestuff business and the tenth anniversary of the appointment to his present post as manager of the Boston office of the General Dyestuff Corp.

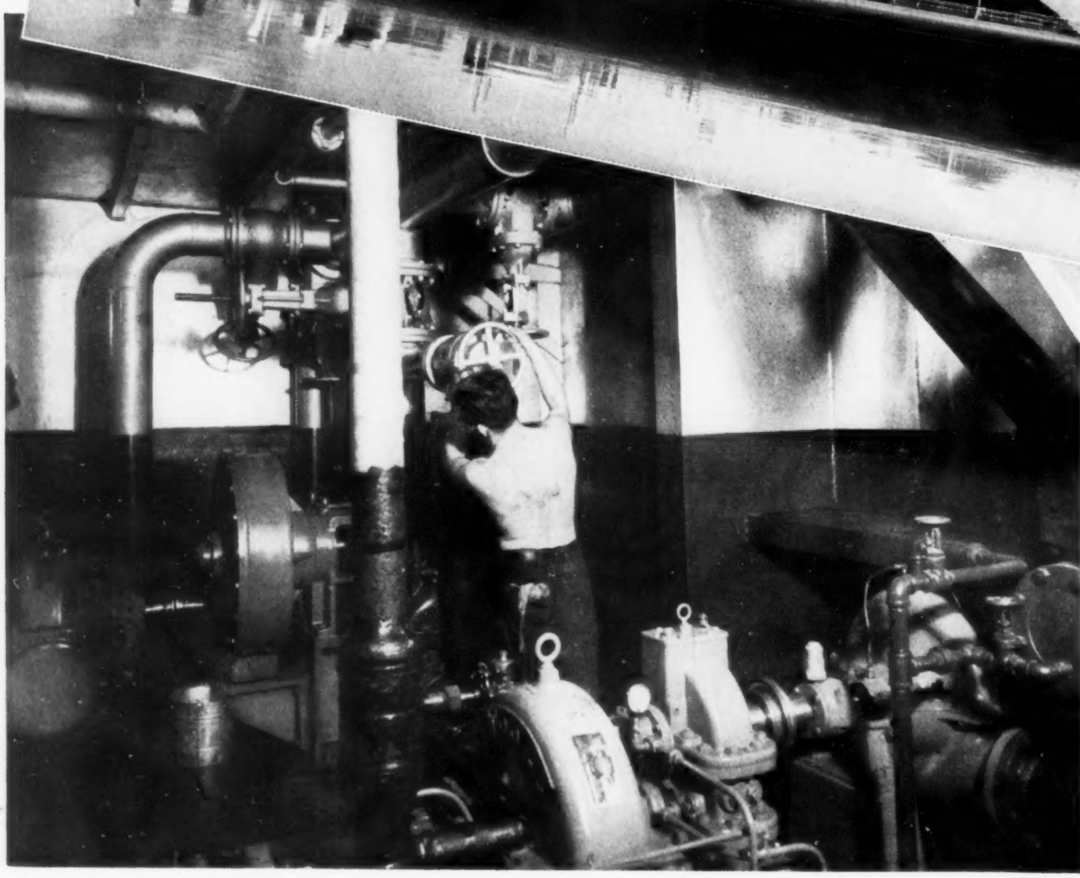
Samuel M. Greer, who was recently elected to the Board of Directors of Commercial Solvents, fills the vacancy caused by the death of William D. Ticknor. He is director of American Steel Foundries and Servel, Inc.



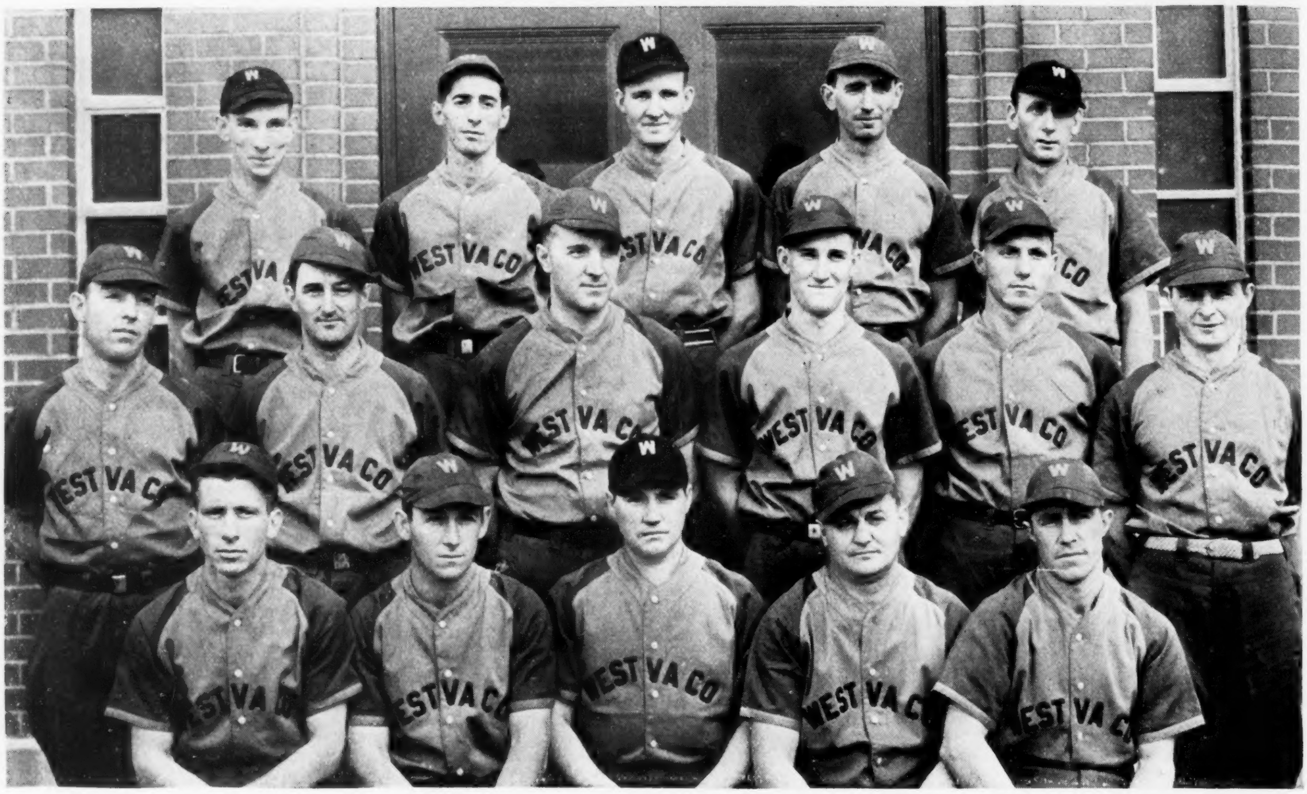
Dr. Victor G. Heiser, newly appointed research director of the National Ass'n of Manufacturers' Committee on Healthful Working Conditions, former director of health of the Philippine Islands and author of "An American Doctor's Odyssey."

Linus C. Coggan succeeds Philip L. Reed as a member of the Board of Directors of Commercial Solvents. He is a director of both the Kansas City Southern Railway and Corn Products Refining.





The twin screw Diesel ship, Dolomite IV, recently built for bulk transportation of lye and other highly corrosive chemicals, brought a bulk cargo of one million gallons of kerosene to Chicago, said to be the first time that kerosene has been shipped in bulk by water, as it corrodes the metals used in cargo tank construction, thus becoming discolored. The Dolomite IV has five main bulkhead cargo tanks lined with sheet nickel, which is spot welded to the frame and arc welded on the seams, giving her the distinction of being the first freight ship to feature nickel cargo tanks. More than 60,000 pounds of nickel were used for her main tanks. In the photograph at left, the pure nickel centrifugal pump (foreground) discharges liquid cargo from the liquid tanks at the rate of 1,500 gallons a minute.




The softball team of the South Charleston, W. Va., plant of Westvaco Chlorine Products, serious contenders for the 1938 championship of the Kanawha Valley.

Successful contestants in the "Gold Trophy Contest." Six months of operation without injuries to any of its personnel is the record achieved by du Pont's Dye Works Construction Dept., which has operated as long as two consecutive years without a mishap. Standing, left to right, O. R. Ames; J. E. Charsha; M. V. Boggs; T. E. Hall; J. B. Vincent; H. C. Leary; G. E. Bubb. Front row, J. A. De Luca; W. T. Zanes; D. E. Hudson; R. C. Fox.

# . . ANOTHER MALLINCKRODT SERVICE . .

## PACKAGES MOST SUITABLE TO THE CHEMICALS

**The container is one of the "big little things" given serious consideration by Mallinckrodt. The problem is studied from every angle and every effort is expended to make the package as perfect as the chemical it contains. Note these typical examples.**

### The New BELL CLOSURE Makes Acid Bottles

***• LEAK-PROOF***

***• DIRT-PROOF***


The Mallinckrodt-developed Bell Closure obviates removal of plaster and paraffin from bottle necks, sticking of ground-glass stoppers, dirt dropping into bottles. The new closures fit any of the new bottles. A turn of the cap and it's off. Another turn and the bottle is perfectly sealed and stays sealed. No leakage or gas escape.

The newly designed shipping case for the Bell Closure bottles is 14 pounds lighter. Bottles returnable for credit as usual.


### MALLINCKRODT BOTTLES

***are***

***• CONVENIENT***

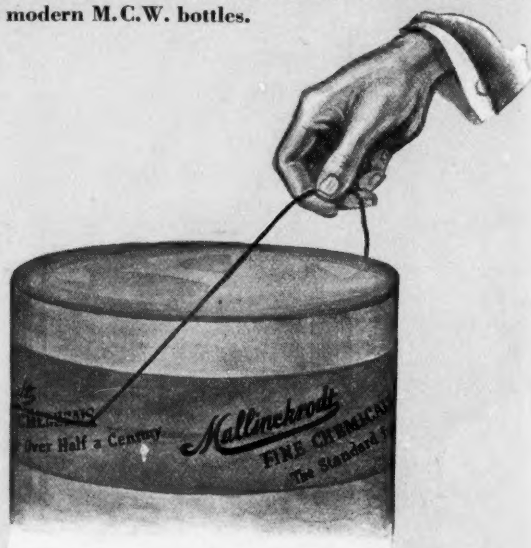
***• PROTECTIVE***

Mallinckrodt chemical bottles are stream-lined. Wide mouths and sloping shoulders provide easy access to chemicals. Extended tests definitely proved that certain chemicals can be packed in clear bottles. For such chemicals Mallinckrodt employs clear bottles so that contents are readily visible. Chemicals proven sensitive to light are packed in black (not amber or blue) bottles for real protection.

Handsome plastic caps, suitably lined, add to convenience of the modern M.C.W. bottles.

## YOU CAN'T BEAT FIBRE DRUMS . . .

which house the 25, 50 and 100-lb. quantities of Mallinckrodt Chemicals. Neat and trim, they open easily (no smashing of the head with danger of getting splinters in contents) — and the lid goes back just as easily, and tightly. The sturdy drums make admirable bulk stock packages.




**2nd & Mallinckrodt Streets—ST. LOUIS**
**CHICAGO**
**PHILADELPHIA**

**Mallinckrodt**
**CHEMICAL WORKS**
***Makers of Fine Chemicals Since 1867***

**72 Gold Street NEW YORK**
**TORONTO**
**MONTREAL**

# CURTIS RESIGNS FROM TVA

**Will Render Part-Time Service to the Authority—He Prefers Private Industry to Government Commercial Production of Fertilizer—Calls Nitrate Plant No. 1 a "Total Loss"—Bogert Receives Priestley Medal at 96th A. C. S. Meeting at Milwaukee—**

Manufacture of fertilizer by private industry is better than by the government because of "red tape" in governmental operations, Dr. Harry A. Curtis, TVA chief chemical engineer, told a Congressional investigating committee at Knoxville last month. Dr. Curtis then added that when the TVA perfects fertilizer processes they should be turned over to private industry. Dr. Curtis admitted that the part of Nitrate Plant No. 2 not used for fertilizer experiments is not being kept in stand-by condition for national defense as required by the TVA act, and that it would take $1,000,000 to put it in such condition as to make it quickly available for producing munitions.

### Calls Plant Obsolete

According to the witness, one-third of Nitrate Plant No. 2 is being used as the fertilizer works, whereas the remaining two-thirds section comprises what the TVA calls for keeping in stand-by condition. Nitrate Plant No. 1 is "obsolete" and a "total loss."

### A Five Man Board?

It has been hinted that the Congressional TVA investigating committee may recommend an executive board for TVA in place of a 3-man directorate. At a session at Knoxville, Tenn., Representative Mead asked Dr. A. E. Morgan if differences did not grow out of an attempt to divide responsibility for various aspects of TVA among the 3 directors and whether enlargement of the board to 5 members, with a chairman with no specific duties except policy-making and coordination, would be advisable. Doctor Morgan readily agreed that a 3-man board is prone to difficulty because of personalities involved when two combine against one.

On Aug. 23 it was announced that Harry A. Curtis had resigned as chief chemical engineer for the Tennessee Valley Authority effective October 1, to become dean of the College of Engineering of the University of Missouri, Columbia, Mo. He will continue to render part-time service to the authority on a consulting basis.

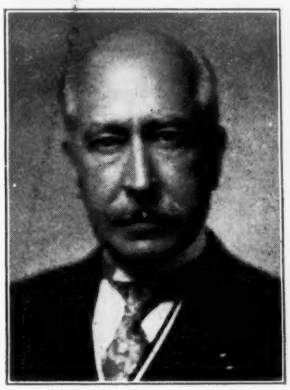
## Milwaukee Host to A. C. S.

Advances in chemistry ranging from greater industrial utilization of agricultural products in the U. S. to Europe's wartime motor fuel needs were reported in nearly 500 papers and addresses at the 96th meeting of the A. C. S., at Milwaukee on Sept. 5-9.

About 3,500 scientists, educators and industrialists representing the laboratories of colleges, universities, technical schools, Federal services, and industries throughout the country participated. Chemists from Canada, England, and Sweden were heard.

The convention opened on Monday with a general meeting in the Milwaukee Auditorium, at which the $1,000 American Chemical Society Award in Pure Chemistry was presented to Dr. Paul D. Bartlett, 31, assistant professor at Harvard University, for "notable research in the important borderline field between organic and physical chemistry." The funds for the prize, in previous years provided by A. C. and Irving Langmuir, brothers, were this year donated by Prof. James E. Kendall of Edinburgh University, Scotland, a former member of the faculties of Columbia and New York Universities.

Dr. Frank C. Whitmore of Pennsylvania State College, president of the Society, delivered an address on "Looking Backward and Forward in American Chemistry." Dr. Gustavus J. Esselen of Boston gave an illustrated lecture on "Air-Bubble Formation in Water as Revealed by Ultra-Slow Motion Photography."



PROF. MARSTON T. BOGERT
*Priestley Medalist—Highest Honor of the A.C.S.*

The Priestley Gold Medal, highest honor of the Society awarded every 3 years, was bestowed upon Dr. Marston Taylor Bogert, 70, professor of organic chemistry at Columbia University and a past president of the Society, "for distinguished service to chemistry" at a public meeting on Tuesday evening. The subject of Dr. Bogert's medal address was "From the Cradle to the Grave."

Six Canadian, 5 English, and one Swedish chemist were among those who reported progress in chemical research at the Divisional sessions which began on Tuesday. T. E. Warren, K. W. Bowles, and R. E. Gilmore of the Canadian Bureau of Mines discussed the hydrogenation of Canadian coals before the Division of Gas and Fuel Chemistry. W. F. Seyer, Herman Nemetz, and William Morris of the University of British Columbia addressed the Division of Petroleum Chemistry, together with S. F. Birch, A. E. Dunstan, F. A. Fidler, F. B. Pim and T. Tait of the Anglo-Iranian Oil Company, Sunbury-on-Thames, Middlesex, England. Dr. H. P. Lundgren, research associate in chemistry at the University of Upsala, spoke before the Division of Physical and Inorganic Chemistry. Noted American chemists who took part in the program included two Nobel Prize winners, Dr. Irving Langmuir of General Electric, and Prof. Harold C. Urey of Columbia; Dr. W. M. Stanley of the Rockefeller Institute for Medical Research; and Dr. Charles A. Kraus of Brown University, president-elect of the Society.

Dr. H. T. Herrick of the U. S. Bureau of Chemistry and Soils, Washington, D. C., outlined the preliminary plans for the establishment of 4 regional laboratories for which Congress has appropriated $4,000,000 annually to conduct researches into and to develop new scientific chemical and technical uses and new and extended markets and outlets for farm commodities. Representatives of the processing industries and of the other Federal Bureaus showed how farm products can be developed into plastics, cellulosic by-products, starches, industrial fats and oils, alcohol, and insecticides which promise to confer lasting benefits upon society. The role of fermentation and industrial uses of naval stores and furans derived from farm waste products will also be described.

Ways to meet industry's demand for trained men as the result of the rapid advance in chemical engineering practice and education was a subject of discussion at a symposium on "Unit Processes," sponsored by the Division of Industrial and Engineering Chemistry.

Three Divisions joined in a symposium on "American Patent Practice and Procedure," at which 3 patent attorneys, Frank E. Barrow of N. Y. City, Thomas H. West of Chicago, and Delos G. Haynes of St. Louis, spoke. Mr. Haynes is vice chairman of the Patent Section of the American Bar Association and a member of the U. S. Patent Office Advisory Committee appointed by the Secretary of Commerce.

## I. C. I. President Retires

H. J. Mitchell, president of Imperial Chemical Industries, Ltd., England, since 1936, is retiring on the advice of his medical advisers, but will remain a director of the company.

# Diamond Alkali Promotes Five

## Important Personnel Changes Announced by Vice-President Cooper—Herrick Heads Up New Government Regional Research Program—Other Personal and Personnel News of the Month—

Several important personnel changes in Diamond Alkali's sales division became effective Sept. 1, according to George S. Cooper, vice-president in charge of sales. A. H. Copeland is now assistant to the vice-president in charge of sales; Fred W. Fraley is director of sales; J. D. Mattern is manager of alkali sales.

J. C. McKenna, formerly N. Y. representative, moves to the main office in Pittsburgh to be assistant manager of alkali sales. C. V. Douglas is now Metropolitan N. Y. representative with headquarters in N. Y. City.

### Herrick In New Role

Horace T. Herrick has been appointed an assistant chief of the Bureau of Chemistry and Soils. Under the general supervision of Dr. Henry G. Knight, Mr. Herrick will assume responsibility, on behalf of the Dept. of Agriculture, for general direction and coordination of chemical and chemical engineering investigations of the 4 regional research laboratories authorized in the A.A.A. of '38. Laboratories are to conduct researches into and develop new scientific, chemical, and technical uses for farm products and by-products. Mr. Herrick has been with the Bureau for 12 years, lately as chief of the Industrial Farm Products Research Division.

### Williams to Battelle

A considerable expansion of the activity of Battelle Memorial Institute in the field of industrial chemical research is indicated by the recent appointment of Richard S. Shutt as supervisor of chemical research, according to an announcement by Clyde E. Williams, director. Dr. Shutt goes to Battelle from a research position with American Cyanamid and Chemical. Previously, he was with Sherwin-Williams, and for several years with du Pont.

### Ellis Goes With Wilson

Joseph Ellis, formerly connected with R. & R. Chemical of 1011 Chestnut st., Phila., joins the sales staff of Frank E. Wilson of 600 S. Delaware av., Philadelphia, and will cover the Philadelphia territory. The Wilson organization sells a complete line of industrial chemicals and maintenance items.

### Personal News Items

Cyanamid vice-president, Warner D. Huntington, who underwent an operation for removal of a brain tumor at Honolulu last month, has been brought to San Francisco . . . Charles J. Brand, N.F.A. secretary, returned Aug. 26 from his vacation at Ocean City, N. J.

Gordon H. Chambers, vice-president, Foote Mineral, Philadelphia, is again sailing for Europe. He leaves Sept. 10 in the *Bremen* and will visit England, Belgium, Holland, France and Italy, returning about Oct. 15.

Williams Haynes, publisher of CHEMICAL INDUSTRIES, will speak before the Delaware Section of the A.C.S. on Nov. 16.

### International Fertilizer Meeting

The American Commercial Attache in Rome states that Italian scientific circles expect that the First International Congress on Chemical Fertilizers, to take place in Rome from Oct. 3 to 6, '38, will be well attended. To date, over 200 papers have been received from scientists all over the world.

Charles J. Brand, N. F. A. Secretary, has just received notice from the Dept. of State that the President has approved his appointment as a delegate on the part of the United States. Thus far the other delegates designated are Dr. Charles H. Kunsman, chief, Fertilizer Research Division, Bureau of Chemistry and Soils, U. S. Dept. of Agriculture, chairman of the delegation; and Archibald H. Rowan, Phosphate Export Association.

### Edouard Ledoux Arrives

Edouard Ledoux, consulting engineer and author in the fields of air conditioning, adsorption and desiccation, arrived recently with Mrs. Ledoux in the *Normandie* for a two-months' vacation. Mrs. Ledoux is American, and will spend some time with her family in Latrobe, Penna. Mr. Ledoux resides in Paris, where he has an extensive consulting practice. He is technical adviser to the French Acticarbone Co. and technical director of Societe Anonyme pour l'Utilisation des Combustibles. He may be reached through the offices of Acticarbone Corp., 62 E. 42d st., N. Y. City.

### Du Pont Disability Plan

The Disability Wage Plan, under which wage earners with one year of service continue to receive pay during periods of illness and disability other than those resulting from occupational injury, was favorably noted recently by du Pont upon completion of the first full year of its operation. The Company described its experience with the program as "a definitely constructive contribution toward satisfactory labor relations."

Wage Roll employees, whose earnings are on an hourly basis, receive for a 3 months period, the same pay while ill as the average for the time when engaged at work.

Du Pont officials commented that the plan is held in high regard both by employees and management. Analysis of the results indicated a tendency for employees to take advantage of the opportunity in financing corrective operations which otherwise they apparently would not have undergone.

During the year, the total direct cost was $1,010,970 or 1.66% of the total wage roll. Under the plan 11,753 employees received benefits.

The average disability rate among women was about twice that of men, it was shown. Married women were absent from their posts through illness more often than their unmarried co-workers.

### First Half Exports Down

U. S. exports of chemicals and related products declined more than 14% to $77,000,000 in the first half of the current year from the $90,000,000 recorded for the first 6 months of 1937, but were still $1,700,000 above the value of such products exported during the corresponding months of 1936.

All major classifications making up the chemical and related products list, except fertilizer materials and sulfur, shared in the loss, particularly industrial chemicals, paint products, naval stores and coal-tar products.

Exports of sulfur, both crude and refined, during the first half of the current year were recorded at 318,885 tons, compared with 258,600 tons in the corresponding months of 1937, while shipments of fertilizer materials to foreign markets during these periods increased from 635,975 to 776,235 tons. Analysis reveals that the latter gain was due to heavier shipments of phosphate materials which were more than enough to offset the decline in exports of potash materials which occurred during these periods.

Exports of coal-tar products declined sharply to a total value of $5,000,000 during the current half-year period from $8,000,000 in the same months in 1937 owing mainly to smaller shipments of benzol, colors, dyes, and stains.

Chemical specialties were well maintained at $13,300,000 in the first half-year, but exports of industrial chemicals declined from $14,115,000 in the first half of 1937 to $12,370,000 in the current period.

Other declines recorded in the first half of the current year, compared with the corresponding months of 1937, included medicinals and pharmaceuticals, exports of which dropped in value from $8,787,000 to $8,250,000; naval stores, from $10,792,500 to $6,448,500; paint products from $11,206,000 to $9,265,000; essential oils from $1,720,000 to $1,147,000; and soaps and toilet preparations, from $4,672,000 to $4,270,000.

# *News of the Specialties*

## Pest Control Convention October 24-26

**Record-Breaking Attendance Expected at 6th Annual Meeting—New Wrinkle, Inc., Formed—Oakite Makes Personnel Changes—Federal Trade Commission Active In Specialty Field —Chipman Chemical to Build New Sulfur Grinding Plant— Agicide to Appeal Dennis Cube Root Patent Ruling—**

From present indications a record-breaking attendance will feature the 6th annual convention of the National Pest Control Association, to be held at the Hotel Fontenelle, Omaha, Neb., on Oct. 24 to 26.

The National Pest Control Association extends a cordial invitation to attend to every person actively engaged in the business of pest control. Whether or not a firm is a member of the National Association, the invitation is open to all owner operators and those engaged in executive capacity. Each person attending makes his own arrangements as to travel and enjoys the special privileges given by Hotel Fontenelle as to rates and accommodations with only one item of expense. There is a registration fee of $5.00 for each person which includes the banquet, entertainment and other features.

Among the outstanding speakers are:

Dr. C. L. Williams, assistant surgeon general, U. S. Public Health Service, who will discuss "Fumigations."

Dr. Thos. E. Snyder, senior entomologist, Bureau of Entomology, U. S. Dept. of Agriculture, who will take as his title "Latest Progress in Research in Termite Control During 1938."

Dr. H. E. Whitmire, St. Louis, Mo., who will take up "Pyrethrum, Derris, Rotenone and Other Plant Poisons."

Dr. Rodman M. Brown, building engineer, Omaha, Neb., who will discuss some phase of pest control with relation to buildings.

Dr. A. E. Back, senior entomologist, Bureau of Entomology, U. S. Dept. of Agriculture, who will assist in connection with problems in moth control and carpet beetles.

There will likewise be a few short papers on general problems by outstanding entomologists to be announced later.

At least 25 manufacturers and supply houses will have booth exhibits. Three "clinics" will feature the general sessions. One will deal exclusively with the business problems of the industry.

### Wrinkle Finish Patents

Organized to control the patents on so-called "wrinkle finishes" used on automobile radios, cash registers, typewriters, calculating machines and a line of similar products, New Wrinkle, Inc., of Dayton, Ohio, has acquired the 17 American and 2 Canadian "Wrinkle" patents of The Chadeloid Chemical Co., The Kay and Ess Chemical Corp., and The Kay and Ess Co. These patents cover all of the irregular surface finishes generally described as Wrinkle, Crinkle, Shrivel, Sag, Morocco, etc., produced with Chinawood oil or its equivalents, and apply to both oxidized and non-oxidized finishes.

Manufacturers of such special finishes are operating at present under a revised form of license developed by New Wrinkle, Inc., which has been received favorably throughout the industry.

The primary objective of New Wrinkle, Inc., is to create an acceptance for "wrinkle finishes" as standard rather than special by developing new and wider uses for these finishes and by solving the specific problems brought up by customers of the organization's licensees.

To attain their objective, New Wrinkle, Inc., will rely on a house magazine and trade paper advertising and is also contemplating publication in book form of a comprehensive collection of technical data including formulae, methods of manufacture and similar information for the exclusive use of its licensees.

### New Sulfur Grinding Plant

Chipman Chemical will erect a sulfur grinding plant in Houston at a probable cost of $200,000, J. T. Sandberg, district manager of the organization, announced last month at Houston.

Construction on the project is expected to start in October. A site for the development has not been selected.

### Oakite Assignments

Oakite Products, Inc., N. Y. City, manufacturer of cleaning materials, announces following divisional rearrangement.

Due to the serious illness of J. A. Maguire, Detroit division manager, which will incapacitate him for active work for a considerable period, company has appointed H. C. Duggan to take charge of sales and service in that division. Mr. Duggan, after having served previously both as an Oakite sales representative and division manager in the Midwest for 11 years, went to New England as division manager in 1935. His headquarters will be in the General Motors Bldg., Detroit.

As a result of these changes, the company's N. Y. and New England divisions have been consolidated into one unit, to be known hereafter as the Northeastern Division. D. X. Clarin, N. Y. division manager, who has been associated with the company for the past 19 years, will head the 18 Oakite sales representatives, in the new consolidated division. His headquarters, as heretofore, will be the company's general offices in N. Y. City.

### F. T. C. Activities

A stipulation to stop misrepresenting the effectiveness of Bug Dust, an insecticide, has been entered into with the Federal Trade Commission by Henry Field Seed Co., Shenandoah, Iowa.

Specialty Paint Co., Inc., 7820 Warren ave., Wauwatosa, Wis., has entered into a stipulation with the Commission to cease representing that Rusticon Primer Surfacer, when applied to metal surfaces, will prevent rust or further deterioration of rusty metal or make impossible the reappearance of rust on such surfaces.

The Commission has issued a complaint charging E. L. Bruce Co., Memphis, Tenn., with unfair competition in connection with the sale of Terminix, a chemical product it manufactures for use in treating lumber in buildings affected by termites.

Columbia Refining Co., 4402-23d st., Long Island City, N. Y., has been served by the F. T. C. with a complaint alleging violation of the Federal Trade Commission Act in the sale of motor oils and lubricants. Complaint alleges that the respondent corporation represents that it owns, controls and operates a refinery and that purchasers of its products are dealing directly with the manufacturer or refiner of such products, when such are not the facts.

Selling a deodorant and germicide designated Sani-Flush, The Hygienic Products Co., Canton, Ohio, under a stipulation entered into with the Commission, will cease certain misleading representations in advertising the product. Representations to be discontinued are that Sani-Flush will banish odors and kill germs generally, and that it is the only method by which a toilet bowl can be cleaned.

### Agicide To Appeal

Agicide Laboratories, Milwaukee, will appeal from the decision of Federal Judge Geiger upholding the validity of the Dennis patent covering certain uses of cube root as an insecticide.

### Transfers Operations

C. P. Gulick, chairman of the board of National Oil Products, Harrison, N. J., reports to stockholders, that the company has completed transfer of certain manufacturing operations from Chicago to its Cedartown plant in the South.

Mr. Gulick, who entered a Montclair, N. J., hospital on July 25, suffering from stomach ulcers, is expected back at his desk some time early in September.

STAUFFER

Stauffer
CHEMICALS

# CAUSTIC SODA

Stauffer Caustic Soda is available in flake or solid form in drums of 50—100—400 and 700 pounds.

Stocks are carried at strategic points for quick delivery, in any quantity, and shipped to reach your plant at the lowest transportation cost.

## OTHER STAUFFER PRODUCTS

BORIC ACID : CARBON TETRACHLORIDE : BORAX
TITANIUM TETRACHLORIDE : SULPHUR CHLORIDE
SILICON TETRACHLORIDE : CREAM OF TARTAR
SULPHURIC ACID : SULPHUR : TARTARIC ACID
WHITING : CARBON BISULPHIDE : LIQUID CHLORINE

## STAUFFER CHEMICAL COMPANY

624 California St., San Francisco, Cal. • 2710 Graybar Bldg., New York, N. Y. • Freeport, Texas • Rives-Strong Bldg., Los Angeles, Cal. Carbide and Carbon Bldg., Chicago, Ill. • 424 Ohio Bldg., Akron, Ohio
Apopka, Florida

Chemicals

# Heavy Chemicals

## Rayon Makers Take More Alkali

**Contraseasonal Expansion In Demand for Industrial Chemicals—Calcium Sulfide Schedule Revamped—Tungsten Derivatives Reduced—Tin Slightly Lower—F. T. C. Charges Calcium Chloride Makers With Price Fixing—Freeport Plans Expansion at Grande Ecaille—Solvay to Add to Syracuse Plant—Chlorate Plant on Pacific Coast to Be Rushed—**

The steady contraseasonal improvement in the demand for industrial chemicals continued in August and for many items the past month was the best one so far this year. This happy state of affairs provides much enthusiasm over the prospects for a busy fall season and an opportunity for producers to make up in part at least for the disastrous first half.

Alkali volume expanded rapidly last month, most of the increase being caused by the sudden and substantial spurt of the rayon manufacturers. Paper, glass, and soap production schedules moved higher, with the result that shipments of alkali into these fields were slightly better. Bichromates were also in better demand, due to the expansion in operations in the tanning, dry color, woolen, and metal fields. Cyanides, chromic acid, nickel salts and other plating chemicals were still in the doldrums. However, production schedules in the automotive industry will be increased rapidly from the season's low-point, for cars in dealers' hands are said to be at a low point and producers are fearful of a shortage in the early fall and until such time as production of '39 models can be brought up to normal. The industry now expects that sales for the coming car-year will jump 25% to 35% over the year just ending. The situation in the mineral acids remains unchanged, except that tonnages are slightly better. Sulfuric shipments to the steel industry, particularly, were much heavier.

Movement of chlorine, alum, copperas and other somewhat seasonal items in the past 60 days has been encouraging. A decided pick-up in the sale and shipment of the miscellaneous line of chemicals employed in silk, cotton, rayon, and woolen dyeing and finishing was reported by all companies catering to these industries.

### Tin Salts React

Price changes in the heavy chemical group were almost entirely confined to those caused by revisions in the quotations on the metals. Tin reacted slightly last month after a long period of rising prices, with the result that sodium stannate, tin crystals, and the tetrachloride were off slightly from the prices prevailing on July 31. A somewhat surprising move was the advance of ½c in antimony metal. This item has been bearish for some time. Downward price revisions were placed in effect for tungstic acid, sodium tungstate, the oxide, and the metal powder. Both barium nitrate and strontium nitrate were lowered ¼c to 6¾c and 7¾c, respectively.

Quotations for calcium sulfide were changed last month. The current price schedule is as follows:—75%, CaS, bulk, car lots, 25 mesh, $42.50 per ton; bags, bulk, $45 per ton, and less car lots, $47.50 to $50 per ton. Prices for the 50 mesh, 75% grade are $1 per ton higher. Eighty per cent., CaS, bulk, car lots, 25 mesh, $47.50 per ton; bags, bulk, $50 per ton and less car lots, $52.50 to $55 per ton, with quotations $1 per ton higher for the 50 mesh material. Schedule is f.o.b. works.

Some of the improved tonnage in the Metropolitan Area was attributed to fear of a general trucking strike expected Sept. 1. Many suppliers warned consumers to anticipate their requirements for at least a two weeks period.

Surprisingly little talk is heard so far on the subject of contract prices for '39. Of course the last two weeks of August find many executives away and sentiment does not begin to crystallize until a week or 10 days after the Labor Day period, but with conditions quite different from those which prevailed a year ago the whole question is one of conjecture.

### Charges Unfair Competition

Four manufacturers alleged to control substantially the entire output of calcium chloride in the U. S., and their trade association, are charged in a complaint issued by the Federal Trade Commission with engaging in a conspiracy to fix prices and with using other unlawful methods to restrain and eliminate competition in the sale of their product.

Respondent companies are Columbia Alkali, Barberton, Ohio, Dow Chemical, Midland, Mich., Michigan Alkali, Wyandotte, Mich., Solvay Process Co., Syracuse, N. Y., and its wholly owned subsidiary, Solvay Sales.

Calcium Chloride Association, 4145 Penobscot Bldg., Detroit, is the trade association named in the complaint.

### Freeport Expansion

A $120,000 sulfur purification plant at Lake Grande Ecaille, Plaquemines Parish, La., will be erected soon by Freeport Sulphur, W. T. Lundy, vice-president, announced on Aug. 9.

Unit will double company's output of "bright yellow" sulfur, which is produced when oil impurities which cause discoloration have been removed, Mr. Lundy said, The addition will be an almost exact duplicate of the present plant.

**Important Price Changes**

| ADVANCED | Aug. 31 | July 31 |
|---|---|---|
| Antimony Metal | $0.11¼ | $0.10¾ |
| Copper nitrate | .162 | .1545 |
| **DECLINED** | | |
| Acid tungstic C.P. | $1.75 | $2.00 |
| tech. | 1.05 | 1.30 |
| Barium nitrate | .06¾ | .07 |
| Sodium stannate | .29 | .29½ |
| Sodium tungstate C.P. | 1.75 | 2.00 |
| tech. | 1.05 | 1.30 |
| Strontium nitrate | .07¾ | .08 |
| Tin metal | .43 | .43½ |
| Tin crystals | .34½ | .35 |
| Tin tetrachloride | .22 | .22¼ |
| Tungsten metal powder | 2.80 | 2.90 |
| Tungstic oxide C.P. | 2.65 | 2.90 |
| tech. | 1.85 | 2.10 |

### Chlorate Plant Plans Revealed

J. D. Ross, Bonneville administrator, disclosed last month that Chipman Chemical of Bound Brook, N. J., is proceeding with intentions to construct a large sodium chlorate plant just east of Cascade Locks and plans to sign a contract in October for a block of hydroelectric power from Bonneville.

Mr. Ross estimated that from 2500 to 5000 kilowatts would be used by the Chipman plant, operating in conjunction with Pennsylvania Salt Manufacturing.

A statement from the Bonneville office said that a sodium chlorate plant with a capacity of 4000 tons would cost about $1,250,000.

### Solvay's Syracuse Expansion

Contracts for the design and construction of a new $2,500,000 plant for Solvay Process Co., to be built at Syracuse, N.Y., have been awarded to The Austin Co., national organization of industrial engineers and builders.

### Sets Chlorine Hearing Date

The Federal Trade Commission has set the time and place for the first hearings in its complaint case against producers of liquid chlorine for Oct. 4, at 10 A. M. in Room 500, 45 Broadway, N. Y. City. Examiner John J. Keenan, of the commission's staff, has been designated as the examiner in the case.

**CARBON TETRACHLORIDE LOWER**

As we go to press a slash of ¼c per lb. in carbon tetrachloride has been reported, effective Sept. 6. The carlot price east of the Mississippi and north of Ohio is now 5c and the l. c. l. quotation is ½c higher. Some re-arrangement of the states in the various geographical divisions has also been made and will be reported on in detail in the next issue.

# Fine Chemical Markets Reported Quiet

**Producers Anticipate Sharp Sales Gains After the Labor Holiday—Cadmium Declines 15c—Mercury Easier—Keen Competition Again Features Vanillin—Bismuth Subcarbonate, Bismuth Subnitrate Advanced—Tartars Firm—Good Season for Citric—New Formaldehyde Producer—**

Some let-down in the weeks just preceding the Labor Day holiday was reported in the markets for fine chemicals, pharmaceuticals, aromatic chemicals and essential oils, but, generally speaking, business was quite satisfactory to most producers considering the period of the year. Sharp increases in sales and shipping orders are anticipated with the end of the summer period and prospects for a busy fall are good. Producers are generally of the opinion that stocks in the hands of consumers are extremely small; that with the improvement in business considerable replenishment will be necessary in the weeks just ahead.

The market presented a fairly stable price picture last month. On the downward side the most unexpected of the declines was the drop of 15c in cadmium metal. Stocks of the metal have been accumulating, due to the poor status of plating, but a decided pick-up in the automotive field appears imminent. This is expected to lend stability to the price situation on this item. No changes were announced in the schedules for the cadmium salts.

Mercury slid down somewhat and ended the past month at a $75 figure. It is said that even some shading on this figure was done. Considerable excitement developed in the mercury market during the month when erroneous reports of the fall of the Almaden mines into the hands of the rebels was reported by certain trade circles.

No let-up appears likely in the bitter competitive position in vanillin. Another decline was put into effect last month, this one of 15c. At the lowered schedule, ex-eugenol is quoted at $2.10 per lb., and ex-guaiacol and ex-lignin at $2.00. Since the present situation became acute, vanillin has been cut $1.00 per lb.

Menthol was in poor demand last month. Prices were somewhat easier for the natural U.S.P. material, the item being quoted at $3.20 at the month-end. No change in the price of the synthetic material was reported.

The advances last month were few and far between. A 20c increase was announced for bismuth subcarbonate and a 15c advance for the subnitrate. On the new basis the subcarbonate in drums is quoted at $1.33-$1.36 and 9c higher in bottles or cans. Subnitrate in drums is quoted at $1.18-$1.20 and a similar differential for bottles and cans. These changes were not caused by any shift in the price of the metal. Producers of the salts have maintained that because of competition there has not been sufficient spread in the bismuth salts for months. Aloin was advanced on two separate occasions in the past month, the first a 10c increase, and the second an advance of 15c. The new price is $2.65 and the rise has been caused by increased cost of the raw material.

The market for camphor was decidedly better, according to the principal market factors. A much better inquiry was noted during the period under review and actual sales were much heavier. Prices remained firm and unchanged. The iodine market and the price schedule for the various iodides held at the reduced levels reached in July and competition appears to have ended for the moment at least. Little change was noted in the tartars, but the price structure continues firm. A slight tapering off in the demand for citric was reported in the last two weeks of the month. The price situation is without change. Leading factors report that consumption over the summer period has been quite satisfactory. A slightly broader movement of acetylsalicylic acid into consuming channels was noted. A fair demand for boric was reported.

Alcohol appears to be somewhat more competitive. The market for aromatic chemicals was under the pre-holiday influence most of August and sales were generally small and for immediate delivery. The same situation was equally true of the essential oils market.

## Kerrigan Returns

James J. Kerrigan, Merck vice-president, was in the *Queen Mary* when she established a new record for the westward crossing, arriving Aug. 8.

## No Change of Name

Pfaltz & Bauer, Inc., Empire State Bldg., N. Y. City, desires to inform the trade that it has not changed its name. The name of the Pfaltz & Bauer Chemical Co. of California has been changed to the McNerney Chemical Co., but this change in no way affects the corporate name of Pfaltz & Bauer, Inc.

## New Citric Producer?

Production of citric acid by the mold fermentation of glucose or other monosaccharides is the subject of U. S. Patent No. 2,121,604, granted to Stauffer Chemical, as assignee of Justin Zender, Chauncey, N. Y.

# *Fine Chemicals*

**Important Price Changes**

| | Aug. 31 | July 31 |
|---|---|---|
| ADVANCED | | |
| Aloin | $2.65 | $2.40 |
| Bismuth subcarbonate | 1.33 | 1.13 |
| Subnitrate | 1.18 | 1.03 |
| DECLINED | | |
| Cadmium metal | $1.05 | $1.20 |
| Menthol | 3.20 | 3.25 |
| Mercury | 75.00 | 76.50 |
| Vanillin, ex eugenol | 2.10 | 2.25 |
| ex guaiacol | 2.00 | 2.15 |
| ex lignin | 2.00 | 2.15 |

## New Formaldehyde Maker

Kay-Fries Chemicals, Inc., N. Y. City, has started production of formaldehyde at its West Haverstraw, N. Y., plant. Annual production capacity of the new unit is between 12,000,000 and 20,000,000 lbs. A synthetic methanol process will be utilized for production.

Distribution of the product will be made by American British Chemical Supplies, Inc., N. Y. City, an associate of the Kay-Fries organization.

## Penick, Jr., at Desk

S. Barksdale Penick, Jr., vice-president of S. B. Penick & Co., N. Y. City, returned to business late in August after an absence of well over a month. Mr. Penick has been convalescent from an eye operation. During his absence a new office was prepared for him.

## Monsanto Opens Detroit Office

Establishment of a district office of Monsanto Chemical, St. Louis, in the Union Guardian Building, Detroit, was announced recently by G. Lee Camp, vice-president. H. P. Walmsley has been transferred from the Cleveland staff of Monsanto to become Detroit district manager.

Maintenance of a sales and technical staff in Detroit will assist Monsanto to better serve the rapidly increasing chemical and plastics needs of the automotive, electrical appliance, pharmaceutical and other important industries, Mr. Camp stated.

## Rushton at Virginia U.

J. H. Rushton, professor of chemical engineering, University of Virginia, announces that Alfred W. Fleer, a graduate of the University of Michigan and chemical engineer and petroleum technologist in the design and development division of Shell Petroleum, joined the staff at Virginia in September as assistant professor in chemical engineering.

# Coal-tar Chemicals

**Important Price Changes**

**ADVANCED**

| | Aug. 31 | July 31 |
|---|---|---|
| None. | | |

**DECLINED**

| | | |
|---|---|---|
| Naphthalene, crude imp. | $1.50 | $1.60 |

### Obituaries

Adolph Lewisohn, 89, president Tennessee Corporation, died Aug. 17 at his Summer home in Upper Saranac Lake, N. Y.

Born in Hamburg, Germany, Mr. Lewisohn came to the U. S. in 1867. He was president of the firm of Adolph Lewisohn & Sons, in N. Y. City, and headed many mining companies, including Tennessee Corp., the Central Development Co., Miami Copper and South American Gold and Platinum Co.

He was particularly well-known to the public through his gifts, including $300,000 to Columbia for its School of Mines building, and Lewisohn Stadium of C. C. N. Y.

**Other Deaths of the Month**

Silas Wilder Howland, 59, member of Guggenheim Bros. and director in nitrate companies, died suddenly on Sept. 1 at his home in Rye, N. Y., from a heart ailment.

Dr. Richard Lee Kramer, 47, technical investigator, Development Dept., du Pont, died suddenly from a heart attack, Aug. 20, at his home in Wilmington. He had been associated with the Company since '20, first as a research chemist, then as a company representative in the London office. In '33 he was returned to Wilmington as technical investigator.

Edward H. Frohner, chief of the research department of Interchemical Corp. at Peekskill, N. Y., died Aug. 25. Coming to Peekskill in 1874, Mr. Frohner joined the firm of A. F. Buchanan & Sons, oil-cloth manufacturers. He was until 1917 with the Standard Textile Co., which was acquired by Interchemical.

### Mining Congress Oct. 24-27

Leaders in the metal mining industry from all parts of the nation will assemble in Los Angeles, from October 24 to 27, to take part in the 5th Annual Metal Mining Convention and Exposition of the American Mining Congress, whose program will embrace a discussion of trends in the industry, mineral taxation, mine financing, legal, tariff, and public relations problems and the industry's relation to the national government.

## Greater Interest in Intermediates

**Sudden Expansion in the Textile and Leather Fields Creates Better Demand for Intermediates and Coal-Tar Acids—Dye Sales Improve—Benzol Shortage Continues—Better Inquiry for Coal-Tar Solvents—Coking Operations Expanding—Cyanamid Sells John Campbell & Co. to Group of Campbell Employees—**

The movement of coal-tar chemicals into consuming channels showed slight improvement in the past 30 days, the greatest gains having been in the intermediates, coal-tar acids and the finished dyes. This is quite understandable in view of the sudden sharp gains in the textile and leather fields. Stocks of dyes in consumer hands have been low for several months and with the advent of heavier producing schedules it was no secret that substantial purchasing would follow immediately. For this reason the movement of intermediates and coal-tar acids has been the feature of the coal-tar markets for several weeks.

Shortage of benzol supplies is still another feature. In certain sections of the country producers are still experiencing some difficulty in making prompt deliveries. This situation is not expected to prevail much longer with the steel plants stepping up production above the 40% rate, the highest for this year to date. Steel producers have been drawing heavily on stocks of byproduct coke, but it is expected that a sharp rise in coking operations will take place in September, and that the upward movement will continue through the fall months.

Shipments of the coal-tar solvents, solvent naphtha, toluol, and xylol failed to show much actual gain in the past month, but at the close a distinct betterment was reported in market inquiries and in shipping instructions against existing contracts. August was the poorest month of an exceptionally poor year in the automotive field—hence coatings manufacturers have been holding down commitments of raw materials to a minimum. They are now getting ready for what they confidently believe will be a much better year. Car manufacturers are rushing re-tooling operations and by the end of the current month most if not all of the big producers should be hitting their full stride.

Most of the other important members of the coal-tar chemical group were quiet. The only price change was a 10c reduction in imported crude naphthalene, to a basis of $1.50. Domestic producers are still holding firmly to their higher prices and very little actual business is being transacted in either domestic or imported at the moment.

Cresol and cresylic acid were without change. The severe competition in the latter seems to have abated considerably. Shipments of phenol were slightly better. A slightly improved state of affairs in the plastics field is reported. Sales of creosote oil are still disappointing, brought about largely by the lack of interest on the part of the usual big consumers, utility companies, the railroads, etc.

### Campbell Ownership

American Cyanamid has disposed of its interest in John Campbell & Co., N. Y. City, to a group of Campbell employees who will carry on the business. A. W. Edwards, who for many years was Philadelphia representative of the company, is the new president; A. P. Lundquist, the new vice-president, has been in charge of the laboratory for a number of years.

Associated with Mr. Edwards is A. E. Raimo who will continue as before to serve the Philadelphia territory. P. H. Philbin, F. C. Bray and J. A. Lees will represent Campbell in the New England territory. New York State and the Mid-West will be represented by T. H. Chapman and N. Y. City by E. C. Jewell. Sales representatives for the southern and western territories will be announced in the near future.

### Perkin Memorial

Commemoration of the centenary of the birth of Sir W. H. Perkin, discoverer of coal-tar dyes, is being arranged by the British Chemical Society and the Society of Chemical Industry. Dr. Herbert Levinstein will deliver a special commemorative lecture Nov. 24 in London.

### Moves San Francisco Office

The San Francisco district offices of Monsanto Chemical, St. Louis, have been moved to 100 Bush st. Edward Schuler is manager. Mr. Schuler is well known in Eastern chemical circles, having been in the N. Y. City office of Monsanto for a period.

### Chemistry of Matches

*Priorities,* house organ of Prior Chemical, N. Y. City, continues in the September issue with its series of stories on the part chemistry has had in the development of everyday articles of modern use. The current topic is matches. We all vaguely recall incidents in our reading of pioneer days of the use of flint and tinder to light fires, but few people today have anything like a vivid appreciation of what it must have been like not to have a swatch of matches at hand. The *Priorities* story tells briefly of the various attempts to produce a satisfactory match and of the ultimate triumph achieved less than 100 years ago.

# *Solvents and Plasticizers*

## Better Inquiry Develops For Solvents

**Competition Forces Revision of Amyl Acetate—Isobutyl Alcohol Reduced 1c—Tributyl Phosphate Now Quoted at 42c —Alcohol Competitive—Outlook Improves In the Coatings and Rubber Industries—**

**Important Price Changes**

**ADVANCED**

| | Aug. 31 | July 31 |
|---|---|---|
| None. | | |

**DECLINED**

| | Aug. 31 | July 31 |
|---|---|---|
| Alcohol, furfuryl | $ .20 | $ .30 |
| Alcohol, Isobutyl, tks. | .07½ | .08½ |
| Amyl acetate (tech.) tks. | .09½ | .10 |
| drs., carloads | .10½ | .11 |
| Tributyl phosphate | .42 | .50 |

### C. S. C. Promotes Sliger

Herbert Sliger has been appointed Eastern sales manager for Commercial Solvents. Mr. Sliger will continue to make his headquarters in N. Y. City.

Born in Terre Haute, Ind., Mr. Sliger graduated from Rose Polytechnic Institute in '20, and, following 7 years of research and sales work for prominent chemical firms, Mr. Sliger became affiliated with the sales department of Commercial Solvents. In '30 he was made manager of the Cleveland branch office, and in '37 was named N. Y. district sales manager.

### Publicker Moves

General offices of Publicker Commercial Alcohol and its affiliates, the Publicker Alcohol & Chemical Sales Corp. and Publicker, Inc., have been moved to 1800 W. Lehigh ave., Philadelphia. Philadelphia telephone number is Radcliff 7000. General offices of the company were formerly located at 260 S. Broad st., Philadelphia.

### Payson Paint & Varnish Reorganized

Payson Paint & Varnish Corp. has been organized to take over the business of the well-known and long-established Payson Varnish Co., whose plant is located at 141st st. and Southern Blvd., N. Y. City. Directors of the new company are H. B. Prior, H. R. Prior, and T. S. Nichols, all of whom are officers of Prior Chemical.

### Alkydol Moves

Alkydol Laboratories, manufacturer of synthetic oils, synthetic resins and specialties for the paint and varnish and other industries, moves from 1706 S. Canal st. to 2038 Carroll ave., Chicago. New quarters provide much larger manufacturing facilities.

### Doan a Vice-President

Leland I. Doan was made a vice-president of Dow Chemical company at a meeting of the board of directors last month. Mr. Doan was already a director, and is general sales manager. Other officers were re-elected.

In the final half of August a much better inquiry for solvents generally became apparent. The first two weeks of the month were probably about as dull as the trade has experienced during the year. The pick-up, of course, can largely be attributed to the stepping up of production schedules in the automotive area with the consequent releasing of orders to the coatings manufacturers. The rubber field has also shown signs of improvement. Replacement sales of tires have been very encouraging over the summer period and have cut into the unwieldy surplus stocks to such an extent that manufacturers in the past 30 days have stepped up operating schedules for the first time in months.

Refiners report a betterment in shipments of petroleum solvents. The price structure generally has remained unchanged in the last 30 days. Producers in the mid-continent area are still somewhat at variance over tank-car quotations on certain of the petroleum solvents. Some weakness was reported in the Chicago tankwagon market. An increase of 1c per gallon in the quotation on one grade of petroleum thinner on the Pacific Coast was announced, but all producers did not concur. This and the situation in the mid-continent area leaves the price structure somewhat of a checker-board.

Other price changes of the month included a rearrangement of the schedule on technical amyl acetate (from fusel oil). In the new schedule tanks are 9½c; carloads, drums, 10½c; l.c.l. drums, 11c, f.o.b. destination, drums included and not returnable. Tributyl phosphate was also quoted lower, the new drum price for l.c.l. quantities being 42c per lb., f.o.b. destination in drum lots. Furfuryl alcohol was still another item to be quoted lower in the past few weeks, and isobutyl alcohol was lowered 1c.

Alcohol continues on a pretty competitive basis, although no further price changes were placed in effect in the past month. Consumption of alcohol for industrial purposes has been disappointing over the past few months, but producers are now more hopeful of a broadening of demand with the fall manufacturing season here. Some movement of anti-freeze has been made into distributing channels.

Glycerine appeared somewhat more stable in the past 30 days. There has been less pressure from material abroad. With the foreign situation in Europe becoming worse rather than better, it would appear unlikely that additional large volumes of foreign crude and refined will be offered in this market in the near future.

Slightly better inquiry was noted for such important items as acetone, butyl alcohol, ethyl acetate, and the more important plasticizers. The price structure of these items appeared unchanged.

### Progress In Power Alcohol

Further reorganization of the power alcohol industry, including the election of John Orr Young as president of the Atchison Agrol Co., was announced Sept. 2 by Wm. W. Buffum, Sr., general manager of The Chemical Foundation, Inc. The reorganization, Mr. Buffum said, will cement the progress already made in the Agrol industry and open the way for additional production.

The recent reorganization, Mr. Buffum states, brings The Chemical Foundation, Inc., of New York, The Chemical Foundation of Kansas Company and the Atchison Agrol Company even closer.

The Atchison Agrol Company will make, merchandise and market Agrol fuel, and will operate as a commercial organization in every respect.

The Chemical Foundation of Kansas Company, with headquarters in an adjoining building, will act as consultant for the firm, and will continue research work on the use of other farm crops in industry.

The Chemical Foundation, Inc., of New York, and the entire farm chemurgic movement will keep in close touch with both organizations in Kansas and encourage their progress.

Mr. Buffum is chairman of the board of directors of the Atchison Agrol Company which now has the following officers: John Orr Young, President, cofounder of Young & Rubicam Advertising, Inc., N. Y. City, a native of Iowa and an eastern farmer; John N. Ledbetter, Jr., N. Y. City, vice-president in charge of sales; Frank L. Robinson, Kearney, Neb., vice-president in charge of farm relations; and Wm. W. Buffum, Jr., Atchison, Kans., secretary-treasurer.

Personnel of The Chemical Foundation of Kansas Company now is Dr. Leo M. Christensen, president; Dr. Harry Miller, vice-president; Leon Champer, secretary-treasurer; and Wm. W. Buffum, Sr., chairman of the board of directors.

### National Agrol Formed

The National Agrol Co. has been incorporated under Delaware laws to manufacture chemicals and chemical compounds. Capital, which amounts to $5,100,000, consists of 50,000 shares of preferred stock of $100 par value and 100,000 shares of common stock of $1 par value.

# Organic Ammoniates Sink in Light Trading

### Sodium Nitrate Price Schedule Renewed—Expect Some Easing In Sulfate of Ammonia—August Cotton Crop Has Bearish Effect—July Tag Sales Encouraging—Potash Deliveries for First Half Total 111,190 Tons, $K_2O$ Basis—

## *Agricultural Chemicals*

| Important Price Changes | | |
|---|---|---|
| ADVANCED | | |
| | Aug. 31 | July 31 |
| Jap Fish Meal | $44.00 | $43.00 |
| DECLINED | | |
| Blood, dom. N. Y. | $2.75 | $3.10 |
| Chicago | 2.75 | 3.00 |
| Imported | 3.10 | 3.35 |
| Calcium phosphate, Imp. | .80 | .81 |
| Tankage, N. Y. | 2.70 | 3.00 |
| Chicago | 2.55 | 2.65 |

The raw fertilizer material market was in the doldrums in the past 30 days. Actual sales were few and far between. Most buyers assumed a waiting attitude on future commitments and their requirements of spot lots for immediate consumption were not sufficient to give trading any snap.

The markets for the natural ammoniates turned about after several months of rising prices and showed sizable declines. Blood and tankage prices were lower, while quotations on nitrogenous material were nominal. Imported dicalcium phosphate was lowered 1c per unit, to a basis of 80c. On the upward side the only important change was a rise in Japanese fish meal. Phosphates and potashes were dull and without any real change.

Interest last month largely centered in the announcement of the nitrate prices for this year. The industry was not particularly taken by surprise when it was reported that no change would be made from existing price levels.

The tension in sulfate of ammonia is likely to lessen somewhat over the next few months with the steel production rate advancing. It was practically impossible to buy for August delivery, but steel operations are now well over 40% and many in the industry expect it will reach 60% by the beginning of October. According to the sulfate price schedule an advance of 25c per ton went into effect on Sept. 1 and the current bulk price is $27 per ton.

The August cotton crop report, showing 11,988,000 bales, had a bearish influence on the raw fertilizer material markets. The estimated cotton acreage this year is some 27% below the total for the previous year.

### July Tag Sales Show Rise

July was the third consecutive month in which fertilizer tax tag sales were larger than in the corresponding month of last year. From the standpoint of actual tonnage such increases do not have much significance, as these months do not account for a large proportion of the year's sales. July is normally the low month of the year, responsible for only 1% of the 12-month tonnage. The increases do tend to indicate, however, that actual consumption in the 17 states during the spring season was as large as shown by the tag sale figures.

In the 17 states combined, July tonnage was 21% larger than a year ago. There was an increase of 12% in the South and one of 69% in the Midwest. These increases were due mainly to larger sales in North Carolina and Indiana.

For the first 7 months of the year total sales were 11% below the same period of '37. In the South there was a 12% drop, but the effect of this was lessened somewhat by the very moderate recession in the Midwest.

With the exception of Oklahoma, where the tonnage is relatively small, each of the states in the South reported smaller sales this year than last. The most important declines took place in South Carolina, Georgia, and Alabama. There was also a decline of nearly a hundred thousand tons in North Carolina. The recession in tonnage in the western part of the cotton belt has been more moderate.

Tag sales in the January-July period in the Midwest were within 3% of last year, with increases reported by Kentucky and Kansas. Indiana sales were only 2% below '37, which was the peak year. Missouri sales have been well below last year, when they were abnormally large.

### The Future Outlook

The outstanding feature of the 1937-38 fertilizer season was that the total estimated tonnage of 7,300,000 tons was considerably above the 10-year average for total fertilizer consumption. The reduction in tonnage of 10% was less than the early season expectations of between 20 and 30%.

While it is still much too early to attempt to guess what the tonnage for the new season is likely to be, it is interesting that *The Potash Journal* of the American Potash Institute, after reviewing many of the different factors involved, states: "Considering all factors at the present time, a moderate reduction in fertilizer sales in the '38-'39 period would seem to be indicated."

### Superphosphate Declines Seasonally

Superphosphate production in June showed about the usual seasonal decline from May. Compared with June of last year there was a decline of 17%, with the South reporting a greater drop than the North. In the 1937-38 fiscal year, output was 5% less than in the preceding year. This was due to the sharp decline in the first half of '38, when production was 18% lower than in the corresponding period of '37. Production in each month from January through June was below the same month of '37. There was an increase in the final 6 months of '37 of 13%.

Shipments of superphosphate from southern plants fell off more last year than did production, but there was a small increase in total shipments reported by acidulators in the North. As a result of the decline in shipments for the country as a whole, exceeding the decline in production, stocks are now well above last year's level. The increase over last year in total stocks, for all plants, is 24%, the result of a sharp rise in stocks of bulk and an actual drop in stocks in base and mixed goods. The larger increase in stocks took place in the North, where production was maintained at the preceding year's level. There was a moderate increase in inventories during June, in line with the usual seasonal trend for the month.

### Potash Statistics

Potash deliveries within the continental U. S., Canada, Cuba, Puerto Rico and Hawaii during the 2nd quarter of the calendar year '38 amounted to 32,434 tons of actual $K_2O$. This was equivalent to 52,673 tons of potash salts. Constituting this total were 46,316 tons of muriate, 537 tons of manure salts, 2,253 tons of sulfate, 3,423 tons of kainit and 144 tons of sulfate of potash magnesia. These figures include salts of domestic and foreign origin, exclusive of importations of potassium nitrate, according to the American Potash Institute.

For the first half of '38 deliveries of $K_2O$ amounted to 111,190 tons, equivalent to 214,472 tons of potash salts, consisting of 158,735 tons muriate; 8,834 tons manure salts, 14,407 tons sulfate; 30,001 tons kainit; and 2,495 tons of sulfate of potash magnesia. Regional distribution on a $K_2O$ basis was as follows:—Northeastern and Mid-Atlantic States, 22,328 tons; Southern States, Virginia included, 50,414 tons; Mid-western States, 14,276 tons; West Coast States, 2,725 tons; chemical potash, 6,662; the remainder, 14,785 tons $K_2O$ was delivered to Canada, Cuba, Puerto Rico and Hawaii. During the first six months of '37 potash deliveries amounted to 359,483 tons of salts with a $K_2O$ equivalent of 178,668 tons. These figures relate to deliveries, not consumption of potash salts.

# Oils, Fats, Decline in Light Trading

## Buyers Adopt More Cautious Attitude on Future Commitments—European War Threat Adds to the Unsettlement—Spot Chinawood Offered at Concessions—Paint Oil Sales To Date Are Disappointing—

The past 30 days witnessed a complete price reversal in the oils and fats markets. Almost without exception quotations lost ground in August after several months of gradually rising prices. The easy tone can be attributed to several causes. Buyers generally are said to have covered their minimum requirements in the buying spurt early in June and July and therefore are in a position to stand aside and await further developments. The last two weeks of August are traditionally poor trading weeks. Lastly, the warlike talk abroad has created a great deal of unsettlement in the minds of many. The markets then, in the last few weeks, have largely been thin ones. Offerings have been light in most instances because of the lack of buying interest.

The Chinawood market becomes more difficult of understanding each week. Offerings from China are lacking and the market here is largely nominal. Yet despite these uncertainties over future supplies, considerable oil has been offered at concessions from the prices prevailing at the end of July. These offers were almost wholly for spot stocks. Some importers have temporarily withdrawn from the market to await more stabilized conditions.

### Chinawood Declines

The weakness in Chinawood was also reflected in declines for the other important drying oils. Perilla, oiticica, linseed, and babassu were all quoted lower in the last few weeks. Despite the encouraging outlook in the building industry the sales of paints and other coatings have not risen as rapidly as was first hoped for. The automotive field has been a distinct disappointment for months and this cut heavily into the normal industrial lacquer sales figures. Refined menhaden and sardine oils were also reduced moderately in sympathy with the recent developments in competing oils.

The tone in the more important members of the vegetable oil group was one of distinct easiness. Coconut, cottonseed soybean, and corn all lost ground in the period under review. Purchasing was generally light.

### Linseed Easier

Linseed prices lost some ground in August. A fair movement of material against contracts previously placed was reported from the producing centers, but new business was extremely light. Cotton oil news over the past 4 weeks was largely bearish in nature. The cotton crop report was larger than most factors expected it to be. Whale oil turned downward and lost 6 points. A fairly steady tone was observed in the animal oils and fats. Buying generally was better in this group than in the vegetable oils.

Generally speaking, sales of raw materials to the "soapers" were in much better volume than the movement of paint oils.

### Reduced Oil Demand

Lowered industrial activity during the first 6 months of 1938 has been reflected in declining prices of flaxseed and of drying oils and reduced demand for oils, according to a report issued recently by the Dept. of Agriculture.

On the basis of conditions about Aug. 1, the U. S. Dept. of Agriculture estimated the 1938 flaxseed crop to be about 8,185,000 bu., compared with a harvest of 6,974,000 from the '37 crop. There is a possibility that the world production of flaxseed in 1938-39 may be somewhat larger than in 1937-38. The crop in India is already harvested. It has been estimated at 18,280,000 bu. compared with 17,800,000 a year ago, and is the largest crop in more than 10 years.

It is too early in the season to have authentic estimates of the acreage now being seeded for the crops of Argentina and Uruguay that will be harvested in the last months of 1938 and the beginning of 1939. Scattered reports from various parts of the country confirm earlier indications of increases in flaxseed acreages in certain sections.

U. S. stocks of the 3 major drying oils, namely, linseed, tung, and perilla, amounted to 298 million lbs. at the close of March, 1938.

It is believed that there will be some carry-over of tung oil in China to add to the new crop which normally is harvested late in the year and comes on the market in the early months of the following year. Due to war conditions in China it is impossible to make any estimate of supplies of this oil that will be available for the coming season.

Fish oils and soybean oil also compete with linseed oil to a limited extent. Stocks of fish oils on hand June 30 amounted to 55 million lbs. compared with 68 million lbs. a year earlier and with 109 million lbs. on June 30, 1936. There is no way of determining available supplies of fish oil during the coming months.

Stocks of soybean oil, in terms of crude oil, on hand June 30, were very large, amounting to 78 million lbs., compared with 48 million on the same date a year ago and 58 million lbs. in 1936. Crop Board reports indicate that the harvested acreage of soybeans grown alone for all purposes will be 9.8% higher in 1938 than in 1937.

# *Fats and Oils*

**Important Price Changes**

| | Aug. 31 | July 31 |
|---|---|---|
| ADVANCED | | |
| Oil Oleo, No. 1 bbls. | \$0.09½ | \$0.09¼ |
| DECLINED | | |
| Oil Babassu | \$0.06⅜ | \$0.06⅝ |
| Oil Chinawood, drs. | .13¼ | .14¾ |
| Tks. | .12½ | .143 |
| Oil Coconut, Manila crude | .03¼ | .03⅜ |
| Oil Corn crude, tks. | .07½ | .08 |
| Refined, bbls. | .09¾ | .10¼ |
| Oil Lard extra, bbls. | .09 | .09½ |
| Oil Linseed, tks. | .079 | .084 |
| Oil Menhaden, refined alkali, tks. | .067 | .069 |
| Light pressed, tks. | .067 | .069 |
| Oil Oiticica, drs. | .10¾ | .11½ |
| Oil Palm Niger | .036 | .04 |
| Oil Palmkernel | .0365 | .0415 |
| Oil Peanut crude, tks. | .07¼ | .08¼ |
| Oil Perilla, tks. | .098 | .10 |
| Oil Sardine, ref'd alkali, tks. | .067 | .069 |
| Light pressed, tks. | .061 | .063 |
| Oil Soybean crude, tks. | .05⅞ | .067 |
| Oil Whale, ref'd nat. | .077 | .083 |
| Light pressed, tks. | .05⅞ | .067 |
| Winter bleached | .081 | .087 |

### Research Products Formed

Research Products Corp. has been formed at Madison, Wisc., by former members of the C. F. Burgess Laboratories, Inc.

### Meyer Branches Out

Herman Meyer, with headquarters with Frey & Horgan, 17 State st., N. Y. City, is about to establish himself as a distributor and special agent for concerns seeking distribution in the east and as an exporter.

### Phila. Golf Tournament

The Chemical Club of Philadelphia will hold its fall golf meeting over the Torresdale-Frankford Country Club course on Sept. 22.

### Maynard with A.C.L.

Dr. Poole Maynard, consulting geolgist with offices at Atlanta, Ga., has been appointed industrial geologist for Atlantic Coast Line Railroad with offices at Wilmington, N. C. Dr. Maynard will continue his independent consulting practice at Atlanta, spending about one week a month on railroad problems.

### C-P-P In England

An English affiliate of Colgate-Palmolive-Peet, Jersey City, has purchased the business and plant of G. W. Goodwin & Sons, Manchester, England. In addition to manufacturing Goodwin products, this plant will provide soap manufacturing facilities to supplement the present importations of Colgate company's products from Canada.

# Natural Dyestuffs, Tanstuffs, in Better Demand

## Spotty Buying In Most of the Natural Raw Materials—Japan Wax Advanced—Shellac Markets Quiet—Light Trading In Turpentine and Rosin—

Irregular conditions were reported in the markets for natural raw materials, some divisions being quite active for the traditional "quiet" season, while others were still spotty. Buyers largely are still holding to spot purchasing where possible and are not particularly anxious to make long-term commitments. The turn for the worse in the international situation has added still another difficult factor for buyers to take into consideration.

There was a general improvement in those natural raw materials which find large consumption in the textile and leather industries. Operating schedules in both these fields have been stepped up swiftly in the last 60 days and with stocks of raw materials generally at a low point, buying has been fairly heavy in the natural dyestuffs and natural tanstuffs. The sharp decline in the corn market was reflected in lower prices for dextrin, starch, tanner's sugar and other corn derivatives. Domestic egg yolk quotations were firmer, a 2c increase placing the latest price at 64c.

There was little change in the wax markets in the past 30 days. Buying was largely of a routine nature and most transactions were for relatively small quantities. Traditionally the two weeks before the Labor Day period are the dullest of the year and the last half of August this year proved no exception. The market was featured, however, by much stronger quotations on Japan wax.

Trading in naval stores was extremely light in the period under review. Even the situation abroad failed to stir up much purchasing for foreign delivery and domestic buyers showed little interest. The price trend was downward during most of the month, in common with most of the other commodity markets. A comparison of Savannah quotations on Aug. 31 and July 29 shows the net changes during the past month:

| | Aug. 31 | July 29 | Net Gain & Loss |
|---|---|---|---|
| B | $3.50 | $3.50 | — |
| D | 3.85 | 3.85 | — |
| E | 4.10 | 4.25 | —.15 |
| F | 4.10 | 4.75 | —.60 |
| G | 4.10 | 4.75 | —.60 |
| H | 4.10 | 4.75 | —.65 |
| I | 4.10 | 4.75 | —.65 |
| K | 4.10 | 4.75 | —.65 |
| M | 4.15 | 4.80 | —.65 |
| N | 5.00 | 5.50 | —.50 |
| WG | 5.20 | 5.80 | —.60 |
| WW | 6.15 | 6.30 | —.15 |
| Y | 6.15 | 6.40 | —.15 |
| Turpentine | .22¼ | .23½ | —.01¼ |

**Shellac Continues Quiet**

The shellac market was a dull affair prior to the Labor Day holiday period. Spot purchasing was small and consumers did not make commitments ahead in any sizable quantities. At the moment there seems little reason why buyers should anticipate their requirements very far in advance. However, it is believed in the trade that the current European war scare might very easily supply the necessary momentum for price advances in the London and Calcutta markets.

### Kelsey In New Field

V. V. Kelsey, for many years vice-president and sales manager, Consolidated Feldspar Corp., Trenton, N. J., has become head of Dominion Minerals, Inc., recently organized to mine and distribute certain ceramic raw materials, with headquarters at Washington, D. C., where he will reside. Mr. Kelsey is prominently known throughout the ceramic industries. He is president of the American Ceramic Society and has been a member of the board of trustees of that organization for a number of years. He is a past-president of the Ceramic Association of N. J.

### Filtrol Expansion

Filtrol Corp. has purchased 2½ acres adjoining the plant in Vernon, Calif., according to Lester L. Robinson, chairman of the board of Filtrol Company of California.

### Bidel In Europe

Leon A. Bidel, president, The Minerals Trading Corp., N. Y. City, left recently for a business trip in Europe. He will visit London where a British company is being organized in connection with the Minerals Trading Corp. of N. Y. to work the Barytes Mines of Bou Mahni, Algeria. He will also visit the mine in Algeria, supervise shipments of barytes to U. S., and expects to return early in October.

### Drops Fluorspar Study

The Tariff Commission has discontinued and dismissed its investigation of differences in costs of production of foreign and domestic fluorspar.

### Forms New Unit

Atlantic Research Products, Inc., has been formed to manufacture and market products developed by the Atlantic Research Associates, Inc., or of products which may be of value to other National Dairy Products Corp. affiliates as consumers.

Atlantic Research Associates, Inc., will continue with its research program in the paint, rubber, paper and similar fields. Staff of the Atlantic Research Associates will be available to the new company for technical and engineering assistance, but will not be concerned with either manufacture or sale of products.

# *Natural Raw Materials*

**Important Price Changes**

| ADVANCED | Aug. 31 | July 31 |
|---|---|---|
| Egg Yolk | $0.64 | $0.62 |
| Wax Japan | .10¼ | .09¼ |
| **DECLINED** | | |
| Dextrin, British Gum | $3.60 | $3.75 |
| Corn Canary | 3.00 | 3.50 |
| White | 3.30 | 3.45 |
| Gambier, Singapore Cubes | .08½ | .10½ |
| Myrobalans, R2 | 17.00 | 17.50 |
| J1 | 27.00 | 27.50 |
| Starch, corn pearl | 2.45 | 2.60 |
| Powdered | 2.55 | 2.70 |
| Sumac, leaf | 68.00 | 69.00 |
| Sumac, ground | 65.00 | 66.00 |
| Valonia cups | 30.00 | 32.00 |

### Salesmen Golf Sept. 13

A special meeting of the membership of the Salesmen's Association of the American Chemical Industry will take place immediately following the final golf tournament at the Shackamaxon Country Club, Westfield, N. J., on Sept. 13, to vote upon the proposal to widen the provisions of section 3, article 3, of the constitution to read as follows:—

"Candidates for admission must be proposed to the membership committee by a member of the association, and seconded by another, to both of whom the candidate must be personally known.

"A list of applicants shall periodically be mailed by the secretary to the entire active membership and if before the next meeting of the membership committee there are no dissenting votes, the membership committee shall act on the applications and submit such names for the acceptance of the executive committee.

"A dissenting vote of two members of the executive committee present shall constitute rejection."

The proposed change has been submitted by the committee appointed by Charles E. Kelly, of Hagerty Brothers, president of the association, to re-draft section 3, article 3, of the new constitution. Committee was composed of Walter Merrill, of Joseph Turner & Co.; Joseph Wafer, of the Industrial Chemical Sales Division of West Virginia Pulp & Paper, and Ralph Dorland, of Dow Chemical.

### Edwards Forms Company

Nitrogen Products, Inc., has been organized at 2 W. 46 st., N. Y. City, to deal in by-product ammonia. Chester S. Edwards is president. He is widely known in the by-product ammonia field, having been associated with Barrett for 18 years, in charge of the sales agency division of the company.

# *Pigments and Fillers*

## Raw Paint Material Markets Dull

### July Flurry Fails to Carry Through August—Casein Advanced Three Times Last Month—Cadmium Orange Reduced 10c—Building Outlook Improves—June Paint Sales Below Expectations—

**Important Price Changes**

| | Aug. 31 | July 31 |
|---|---|---|
| ADVANCED | | |
| Casein 20-30 | \$0.10 | \$0.08 |
| 80-100 | .10½ | .08½ |
| DECLINED | | |
| Cadmium sulfide | \$0.90 | \$1.00 |

### Stroock & Wittenberg Expansion

A. J. Wittenberg has been elected president of Stroock & Wittenberg Corporation, 17 Battery pl., N. Y. City, a newly formed organization which will take over and expand the natural and synthetic resins business formerly conducted by Stroock & Wittenberg Corp. Mr. Wittenberg, nationally-known figure in the resin field, accepted the new post Aug. 5, 1938.

The new Stroock & Wittenberg Corporation, fortified by additional financial resources, will be the nucleus of a major research and expansion program in the natural and synthetic resins field. It will have at its disposal many basic raw materials, several new products and the benefits of wider and up-to-date research facilities. Special emphasis will be placed on the purification and preparation of natural resins for use in the protective coating industry.

The personnel of the new Stroock & Wittenberg Corporation will continue to service the trade and will be augmented by additional members to the staff, long known in the resin business. The S & W organization is one of the oldest and best known in the resin field. For over 15 years it has enjoyed an excellent record in the development, manufacture and sale of gums and resins.

A. J. Wittenberg, the newly elected president, who will direct the new program of expansion, needs no introduction to paint, varnish and lacquer manufacturers. He is well known nationally and has visited and serviced practically all the coating plants in the country. He has been actively identified with the programs and aims of the Paint, Varnish & Lacquer Association, the American Gum Importers Association, and the Synthetic Resin Manufacturers Association. He served as an officer in the last two mentioned groups.

Along with his executive duties, Mr. Wittenberg will continue in close personal touch with the industry as before. While the organization of the Stroock & Wittenberg Corporation has been completed, other pertinent plans now in mind will be announced at a later date.

The August market for raw paint materials was somewhat quieter than that prevailing in July. There is still plenty of optimism over the Fall outlook, but buyers were largely holding off on any additional commitments until after the Labor Day holiday. Price stability continued to feature most items.

The recovery in casein, which has been noted in the last few market reports, became much more pronounced last month. Three separate advances were made, the first one of a full cent, followed by two others of ½c each. The explanation of the sudden pressure on casein is that the farmers were disgusted with the low prices prevailing and stopped producing. With an improvement in the demand in the last 6 weeks stocks have been reduced radically. Whether domestic prices will go through the level where it is possible to import Argentine material remains to be seen, but the trade generally does not feel that the market will go above 12c for the time being.

Cadmium sulfide was off 10c to a basis of 90c-\$1.05. This was caused by a reduction in metallic cadmium. The natural varnish gums were again weak, a trend that has been commented on now for the past few months. There seem to be bearish influences at work in the primary centers and replacement cables continue to point to still lower prices for many important members of the group.

The steady metal markets have prevented any price changes in the lead or zinc pigments. Demand has not been as great as the producers expected. What orders have been placed have largely been of the immediate delivery type.

#### Building Outlook Brighter

The building industry, paced by residential construction, continued in July to compare more favorably with past records, according to compilations of the F. W. Dodge Corp., showing the valuation of all residential contracts awarded for July, 1938, was \$87,978,000, which is \$6,932,000 ahead of July, last year. Improvement in July residential construction was sufficient to bring the total 7 months' figure to a point just 18% behind the first 7 months of 1937. It is interesting to observe that the residential record during this 7 month period, while behind last year, is 20% ahead of 1936.

#### Coatings Makers More Active

Manufacturers of coatings for the automotive field are beginning to come into the raw material markets in larger numbers. Production of cars hit the seasonal low ebb in August and from now on output should begin to make favorable comparison with last year's monthly totals. Leading executives in the Detroit area now expect about 25% more production in this automobile year than in the last.

#### June Paint Sales Disappointing

June paint sales, as reported by the Bureau of Census, totaled \$33,936,706 by 680 establishments, as against \$36,827,421 in May and \$41,656,085 in June of last year.

Sales for the first half of '38 totaled \$180,965,715 against \$235,058,533 in the same period of '37. Lacquer sales for the 2nd quarter of the year totaled 7,981,566 gals. with a value of \$10,209,757 against 7,934,838 gals. valued at \$9,860,-662 in the year's first quarter. In the second quarter of 1937 the sales of lacquer totaled 13,066,499 gals. valued at \$16,160,078.

### New Cellulose Acetate Plant

U. S. Industrial Alcohol Co. is now completing a plant for the production of cellulose acetate for use as a plastic through a process developed and owned by the company. This plant, located at Curtis Bay, Md., will be in operation near the end of the year with an annual capacity in excess of 500,000 lbs.

### Paint Convention Plans

The National Paint, Varnish & Lacquer Association has received advice that the Ambassador Hotel, Convention Headquarters, is filled to capacity. Those desiring to attend the convention who have not as yet made their hotel reservations are urged to send them directly to the Ritz-Carlton Hotel, Atlantic City, the auxiliary hotel directly adjacent to the Ambassador Hotel on the Boardwalk. All kinds of desirable accommodations are available and those making reservations will be well pleased with the excellent facilities afforded at the Ritz-Carlton.

It is the industry's Golden Jubilee Convention. The dates are Oct. 26-27-28. Some new and novel entertainment features have been planned for the biggest and best convention yet held.

### To Market "Calux"

Rex Campbell & Co., 7 Idol lane, Eastcheap, London, has been granted exclusive sales rights for the British Empire for "Calux," luminous pigment manufactured by American Luminous Products Co., Huntington, Calif.

# Prices Current

**_Heavy Chemicals, Coal-tar Products, Dye-and-Tanstuffs, Colors and Pigments, Fillers and Sizes, Fertilizer and Insecticide Materials, Petroleum Solvents and Chemicals, Naval Stores, Fats and Oils, etc._**

**Chemical prices** quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f. o. b. works are specified as such. Import chemicals are so designated. Resale stocks when a market factor are quoted in addition to maker's prices and indicated "second hands."

**Oils** are quoted spot New York, ex-dock. Quotations f. o. b. mills, or for spot goods at the Pacific Coast are so designated.

**Raw materials** are quoted New York, f. o. b., or ex-dock. Materials sold f. o. b. works or delivered are so designated.

**The current range** is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both. Containers named are the original packages most commonly used.

**Purchasing Power of the Dollar: 1926 Average—$1.00 - 1937 Average $1.10 - Jan. 1938 $1.20 - August 1938 $1.23**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Acetaldehyde, drs, c-l, wks lb. | ... | .14 | ... | .14 | ... | .14 |
| **Acetaldol, 95%, 50 gal drs wks** lb. | .21 | .25 | .21 | .25 | .21 | .25 |
| Acetamide, tech, lcl, kegs lb. | .39 | .43 | .32 | .43 | .32 | .43 |
| Acetanalid, tech, 150 lb bbls lb. | ... | .29 | .29 | .32 | .24 | .29 |
| Acetic Anhydride, drs, f.o.b. wks, frt all'd lb. | .10½ | .11 | .10½ | .11 | .13 | .15 |
| Acetin, tech, drs lb. | ... | .33 | ... | .33 | .22 | .33 |
| Acetone, tks, f.o.b. wks, frt all'd lb. | ... | .04¾ | ... | .04¾ | .04¾ | .06½ |
| drs, c-l, f.o.b. wks, frt all'd lb. | ... | .05¾ | ... | .05¾ | .05¾ | .07½ |
| Acetyl chloride, 100 lb cbys lb. | .55 | .68 | .55 | .68 | .55 | .68 |
| **ACIDS** | | | | | | |
| Abietic, kgs, bbls lb. | .08¾ | .09 | .08¾ | .10 | .06¾ | .10 |
| **Acetic, 28%, 400 lb bbls,** | | | | | | |
| c-l, wks 100 lbs. | ... | 2.23 | ... | 2.23 | 2.23 | 2.53 |
| glacial, bbls, c-l, wks 100 lbs. | ... | 7.62 | ... | 7.62 | 7.62 | 8.70 |
| glacial, USP, bbls, c-l, wks 100 lbs. | ... | 10.25 | ... | 10.25 | 10.50 | 12.43 |
| **Acetylsalicylic, USP, 225 lb** bbls lb. | ... | .60 | ... | .60 | .50 | .60 |
| Adipic, kgs, bbls lb. | ... | .72 | ... | .72 | ... | .72 |
| Anthranilic, ref'd, bbls lb. | 1.15 | 1.20 | 1.15 | 1.20 | .85 | 1.00 |
| tech bbls lb. | | .75 | ... | .75 | ... | .75 |
| Ascorbic, bot. oz. | 3.00 | 3.25 | ... | ... | ... | ... |
| Battery, cbys, wks 100 lbs. | 1.60 | 2.55 | 1.60 | 2.55 | 1.35 | 2.60 |
| Benzoic, tech, 100 lb kgs lb. | .43 | .47 | .43 | .47 | .43 | .47 |
| USP, 100 lb kgs lb. | .54 | .59 | .54 | .59 | .54 | .59 |
| **Boric, tech, gran, 80 tons,** bgs, delv ton *a* | ... | 96.00 | 95.00 | 96.00 | ... | 95.00 |
| Broenner's, bbls lb. | ... | 1.11 | ... | 1.11 | ... | 1.11 |
| Butyric, edible, c-l, wks, cbys lb. | 1.20 | 1.30 | 1.20 | 1.30 | 1.20 | 1.30 |
| synthetic, c-l, drs, wks lb. | ... | .22 | ... | .22 | ... | .22 |
| wks, lcl lb. | ... | .23 | ... | .23 | ... | .23 |
| tks, wks lb. | ... | .21 | ... | .21 | ... | .21 |
| Camphoric, drs lb. | 5.50 | 5.70 | 5.50 | 5.70 | 5.50 | 5.70 |
| Chicago, bbls lb. | ... | 2.10 | ... | 2.10 | ... | 2.10 |
| **Chlorosulfonic, 1500 lb drs,** wks lb. | .03½ | .05 | .03½ | .05 | .03½ | .05 |
| Chromic, 99¼%, drs, delv lb. | .15¼ | .17¼ | .15¼ | .17¼ | .15¼ | .16¼ |
| **Citric, USP, crys, 230 lb** bbls lb. *b* | .22 | .23½ | .22 | .25 | .24 | .26 |
| anhyd, gran, bbls lb. *b* | ... | .25½ | .25½ | .26½ | .26½ | .29 |
| Cleve's, 250 lb bbls lb. | ... | .57 | .50 | .57 | .50 | .52 |
| **Cresylic, 99%, straw, HB,** drs, wks, frt equal gal. | .73 | .74 | .73 | .91 | .72 | .91 |
| **99%, straw, LB, drs, wks,** frt equal gal. | .78 | .86 | .78 | .94 | .77 | .94 |
| **resin grade, drs, wks, frt** equal lb. | .09¼ | .09¾ | .09¼ | .11¼ | .09 | .11¼ |
| Crotonic, bbls, delv lb. | .21 | .50 | .21 | 1.00 | .75 | 1.00 |
| Formic, tech, 140 lb drs lb. | .10½ | .11½ | .10½ | .11½ | .10½ | .13 |
| Fumaric, bbls lb. | ... | .75 | .60 | .75 | ... | .60 |
| **Fuming, see Sulfuric (Oleum)** | | | | | | |
| Gallic, tech, bbls lb. | .70 | .73 | .70 | .79 | .65 | .75 |
| USP, bbls lb. | .77 | .81 | .77 | .91 | .77 | .91 |
| Gamma, 225 lb bbls, wks lb. | ... | .85 | ... | .85 | ... | .85 |
| H, 225 lb bbls, wks lb. | .50 | .55 | .50 | .55 | .50 | .55 |
| Hydriodic, USP, 47% bottles lb. | ... | 2.30 | 2.20 | 2.30 | ... | ... |
| **Hydrobromic, 34% conct 155** lb cbys, wks lb. | .42 | .44 | .42 | .44 | .40 | .42 |
| **Hydrochloric, see muriatic** | | | | | | |
| Hydrocyanic, cyl, wks lb. | .80 | 1.30 | .80 | 1.30 | .80 | 1.30 |
| **Hydrofluoric, 30%, 400 lb** bbls, wks lb. | .07 | .07½ | .07 | .07½ | .07 | .07½ |
| **Hydrofluosilicic, 35%, 400** bbls, wks lb. | .09 | .09½ | .09 | .15 | .10½ | .15 |
| Lactic, 22%, dark, 500 lb bbls lb. | .02½ | .02¾ | .02½ | .02¾ | .02½ | .02¾ |
| 22%, light ref'd, bbls lb. | .03½ | .03¾ | .03½ | .03¾ | .03½ | .03¾ |
| 44%, light, 500 lb bbls lb. | .05½ | .05¾ | .05½ | .05¾ | .05½ | .05¾ |
| 44%, dark, 500 lb bbls lb. | .06½ | .06¾ | .06½ | .06¾ | .06½ | .06¾ |
| **50%, water white, 500** lb bbls lb. | .10½ | .11½ | .10½ | .11½ | .10½ | .11½ |
| USP X, 85%, cbys lb | .42 | .45 | .42 | .45 | .42 | .50 |
| Lauric, drs. lb. | 11¾ | .12¼ | .08½ | .12¼ | ... | ... |
| Laurent's, 250 lb bbls lb. | .45 | .46 | .45 | .46 | .45 | .46 |
| Levulinic, 5 lb bot, wks lb. | ... | 2.00 | ... | 2.00 | ... | ... |
| Linoleic, bbls lb. | ... | .20 | ... | .20 | .16 | .20 |
| Maleic, powd, kgs lb. | .30 | .40 | .30 | .40 | .29 | .40 |
| Malic, powd, kgs lb. | .45 | .60 | .45 | .60 | .45 | .60 |
| Metanillic, 250 lb bbls lb. | .60 | .65 | .60 | .65 | .60 | .65 |
| Mixed, tks, wks N unit | .06½ | .07¼ | .06½ | .07¼ | .06½ | .07¼ |
| S unit | .008 | .009 | .008 | .009 | .008 | .009 |
| Monochloracetic, tech, bbls lb. | .16 | .18 | .16 | .18 | .16 | .18 |
| Monosulfonic, bbls lb. | 1.50 | 1.60 | 1.50 | 1.60 | 1.50 | 1.60 |
| **Muriatic, 18°, 120 lb cbys,** | | | | | | |
| c-l, wks 100 lb. | ... | 1.50 | ... | 1.50 | 1.35 | 1.50 |
| tks, wks 100 lb. | ... | 1.00 | ... | 1.00 | ... | 1.00 |
| 20°, cbys, c-l, wks 100 lb. | ... | 1.75 | ... | 1.75 | 1.45 | 1.75 |
| tks, wks 100 lb. | ... | 1.10 | ... | 1.10 | ... | 1.10 |
| 22°, c-l, cbys, wks 100 lb. | ... | 2.25 | ... | 2.25 | 1.95 | 2.25 |
| tks, wks 100 lb | ... | 1.60 | ... | 1.60 | ... | 1.60 |
| CP, cbys lb. | .06½ | .07⅛ | .06½ | .07⅛ | .06½ | .07⅛ |
| N & W, 250 lb bbls lb. | .85 | .87 | .85 | .87 | .85 | .87 |
| Naphthenic, 240-280 s.v., drs lb. | .10 | .13 | .10 | .13 | .10 | .14 |
| Sludges, drs lb. | ... | .05 | ... | .05 | .05 | .10 |
| Naphthionic, tech, 250 lb bbls lb. | .60 | .65 | .60 | .65 | .60 | .65 |
| **Nitric, 36°, 135 lb cbys, c-l,** wks 100 lb. *c* | ... | 5.00 | ... | 5.00 | ... | 5.00 |
| 38°, c-l, cbys, wks 100 lb. *c* | ... | 5.50 | ... | 5.50 | ... | 5.50 |
| 40°, cbys, c-l, wks 100 lb. *c* | ... | 6.00 | ... | 6.00 | ... | 6.00 |
| 42°, c-l, cbys, wks 100 lb. *c* | ... | 6.50 | ... | 6.50 | ... | 6.50 |
| CP, cbys, delv lb. | .11½ | .12½ | .11½ | .12½ | .11½ | .12½ |
| **Oxalic, 300 lb bbls, wks, or** N Y lb. | .10¾ | .12 | .10¾ | .12 | .10¾ | .12 |
| Phosphoric, 85%, USP, cbys lb. | .12 | .14 | .12 | .14 | .12 | .14 |
| 50%, acid, c-l, drs, wks lb. | .06 | .08 | .06 | .08 | .06 | .08 |
| 75%, acid, c-l, drs, wks lb. | .09 | .10½ | .09 | .10½ | .09 | .10½ |
| Picramic, 300 lb bbls, wks lb. | .65 | .70 | .65 | .70 | .65 | .70 |
| Picric, kgs, wks lb. | .35 | .40 | .35 | .40 | .35 | .40 |
| Propionic, 98% wks, drs lb. | ... | .22 | ... | .22 | .20 | .22 |
| 80% lb. | .16 | .17½ | .16 | .17½ | .16 | .17½ |
| **Pyrogallic, tech, lump, pwd,** bbls **lb.** | ... | 1.05 | ... | 1.05 | ... | ... |
| cryst. USP lb. | 1.45 | 1.63 | 1.45 | 1.63 | 1.30 | 1.48 |
| Ricinoleic, bbls lb. | ... | .35 | .35 | .38 | .35 | .38 |
| tech, bbls **lb.** | ... | **.13** | ... | **.13** | ... | ... |
| **Salicylic, tech, 125 lb bbls,** wks lb. | ... | .33 | ... | .33 | ... | .33 |
| USP, bbls **lb.** | **.40** | **.45** | **.40** | **.45** | ... | ... |
| Sebacic, tech, drs, wks lb. | .37 | .41 | .37 | .41 | .37 | .41 |
| Succinic, bbls lb. | ... | .75 | ... | .75 | ... | .75 |
| Sulfanilic, 250 lb bbls, wks lb. | .17 | .18 | .17 | .18 | .17 | .18 |
| Sulfuric, 60°, tks, wks ton | ... | 13.00 | ... | 13.00 | 12.00 | 13.00 |
| c-l, cbys, wks 100 lb. | ... | 1.25 | ... | 1.25 | 1.10 | 1.25 |
| 66°, tks, wks ton | ... | 16.50 | ... | 16.50 | 15.50 | 16.50 |
| c-l, cbys, wks 100 lb. | ... | 1.50 | ... | 1.50 | 1.35 | 1.50 |
| CP, cbys, wks **lb.** | .06½ | .07½ | .06½ | .07½ | .06½ | .07½ |
| **Fuming (Oleum) 20% tks,** wks ton | ... | 18.50 | ... | 18.50 | ... | 18.50 |
| Tannic, tech, 300 lb bbls lb. | .40 | .47 | .40 | .47 | .19 | .47 |
| **Tartaric, USP, gran, powd,** 300 lb bbls lb. | .27¼ | .27¾ | .24¼ | .27¾ | .21¾ | .25¼ |
| Tobias, 250 lb bbls **lb.** | .65 | .67 | .65 | .67 | .65 | .67 |
| Trichloroacetic bottles lb. | 2.00 | 2.50 | 2.00 | 2.50 | 2.00 | 2.50 |
| kgs **lb.** | | 1.75 | | 1.75 | ... | 1.75 |
| Tungstic, tech, bbls lb. | 1.65 | 1.75 | 1.65 | 2.00 | ... | ... |
| Vanadic, drs, wks lb. | 1.10 | 1.20 | 1.10 | 1.20 | 1.10 | 1.20 |
| **Albumen, light flake, 225 lb** bbls lb. | .52 | .60 | .52 | .60 | .47 | .60 |
| dark, bbls lb. | .13 | .18 | .11 | .18 | .11 | .17 |
| egg, edible lb. | .80 | .82 | .80 | 1.15 | .76 | 1.15 |
| vegetable, edible lb. | .74 | .78 | .74 | .78 | .76 | .78 |
| **Alcohol, Amyl (from Pentane)** | | | | | | |
| tks, delv lb. | ... | .106 | .106 | .123 | ... | .123 |
| c-l, drs, delv lb. | ... | .116 | .116 | .133 | ... | .133 |
| lcl, drs, delv **lb.** | ... | .126 | .126 | .143 | ... | .143 |
| Amyl, secondary, tks, delv lb. | ... | .08½ | ... | .08½ | ... | .08½ |
| drs, c-l, delv E. of Rockies **lb.** | ... | .09½ | ... | .09½ | ... | ... |
| Benzyl, cans lb. | .68 | 1.00 | .68 | 1.00 | .65 | 1.10 |
| **Butyl, normal, tks, f.o.b.** wks, frt all'd lb. *d* | ... | .08½ | .08½ | .09 | .08½ | .09 |
| **c-l, drs, f.o.b. wks,** frt all'd lb. *d* | ... | .09½ | .09½ | .10 | .09½ | .10 |
| **Butyl, secondary, tks,** delv lb. *d* | ... | .06 | ... | .06 | .06 | .07 |
| c-l, drs, delv lb. *d* | ... | .07 | ... | .07 | .07 | .08 |
| Capryl, drs, tech, wks lb. | ... | .85 | ... | .85 | ... | .85 |
| Cinnamic, bottles **lb.** | 2.00 | 2.50 | 2.00 | 2.50 | 2.00 | 3.65 |
| Denatured, CD, 14, 13, c-l, drs, wks. gal. *e* | ... | .33 | .33 | .35 | .33 | .35 |
| tks, East, wks **gal.** | ... | .25 | .25 | .29 | ... | ... |
| **Western schedule, c-l,** drs, wks gal. *e* | ... | .36 | .36 | .38 | .37 | .39 |
| Denatured, SD, No. 1, tks | ... | .23 | .23 | .27 | .26 | .27 |
| c-l, drs, wks gal. *e* | ... | .29 | .29 | .33 | .32 | .33 |

*a* Powdered boric acid $5 a ton **higher in each case; USP $15** higher; *b* Powdered citric is ½c higher; kegs are in each case ½c higher than bbls.; *y* Price given is per gal.

*c* Yellow grades 25c per 100 lbs. **less in each case;** *d* Spot prices are 1c higher; *e* **Anhydrous is 5c higher in each case;** *f* **Pure prices are** 1c higher in each case.

**ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Alcohols (continued): | | | | | | |
| Diacetone, pure, c-l, drs, delv ....lb. *f* | ... | .11½ | ... | .11½ | ... | .11½ |
| tech, contract, drs, c-l, delv ....lb. | ... | .10½ | ... | .10½ | ... | ... |
| **Ethyl, 190 proof, molasses, tks** ....gal. *g* | ... | 4.49½ | 4.04 | 4.51½ | 4.05 | 4.07 |
| c-l, drs ....gal. *g* | ... | 4.55½ | 4.10 | 4.59½ | 4.11 | 4.12 |
| c-l, bbls ....gal. *g* | ... | 4.56½ | 4.11 | 4.58½ | 4.12 | 4.13 |
| absolute, drs., f.o.b. wks. *g* | 4.88 | 4.95 | 4.40 | 4.93 | 4.54 | 6.08½ |
| **Furfuryl, tech, 500 lb drs** lb. | .25 | .35 | .25 | .35 | .30 | .35 |
| **Hexyl, secondary tks, delv** lb. | ... | .12 | ... | .12 | .11½ | .12 |
| c-l, drs, delv ....lb. | ... | .13 | ... | .13 | .12½ | .13 |
| Normal, drs, wks ....lb. | 3.25 | 3.50 | 3.25 | 3.50 | 3.25 | 3.50 |
| Isoamyl, prim, cans, wks lb. | ... | .32 | ... | .32 | ... | .32 |
| drs, lcl, delv ....lb. | ... | .27 | ... | .27 | ... | .27 |
| **Isobutyl, ref'd, lcl, drs** ..lb. | ... | .09 | .09 | .10 | ... | .10 |
| c-l, drs ....lb. | ... | .08½ | .08½ | .09½ | ... | .09½ |
| tks ....lb. | ... | .07½ | .07½ | .08½ | ... | .08½ |
| **Isopropyl, ref'd, 91%, c-l, drs, f.o.b. wks, frt all'd** ....lb. | ... | .36 | ... | .36 | .39½ | .45 |
| Ref'd 98%, drs. f.o.b. wks, frt all'd ....gal. | ... | .41 | ... | .41 | ... | ... |
| Tech 91%, drs, above terms ....gal. | ... | .33½ | ... | .33½ | ... | ... |
| tks, same terms ...gal. | ... | .28½ | ... | .28½ | ... | ... |
| Tech 98%, drs, above terms ....gal. | ... | .37½ | ... | .37½ | ... | ... |
| tks, above terms ..gal. | ... | .32½ | ... | .32½ | ... | ... |
| Spec Solvent, tks, wks gal. | ... | .24 | .24 | .28 | .27 | .28 |
| **Aldehyde ammonia, 100 gal drs** ....lb. | .80 | .82 | .80 | .82 | .80 | .82 |
| Aldehyde Bisulfite, bbls, delv ....lb. | ... | .17 | ... | .17 | ... | ... |
| Aldol, 95%, 55 and 110 gal drs, delv ....lb. | ... | .20 | ... | .20 | ... | ... |
| **Alphanaphthol, crude, 300 lb bbls** ....lb. | ... | .52 | ... | .52 | ... | .52 |
| **Alphanaphthylamine, 350 lb bbls** ....lb. | .32 | .34 | .32 | .34 | .32 | .34 |
| Alum, ammonia, lump, c-l, bbls, wks ....100 lb. | 3.40 | 3.65 | 3.40 | 3.65 | 3.00 | 3.25 |
| delv NY, Phila ...100 lb. | ... | 3.40 | ... | 3.40 | 3.15 | 3.40 |
| Granular, c-l, bbls, wks ....100 lb. | 3.15 | 3.40 | 3.15 | 3.40 | 2.75 | 3.00 |
| Powd, c-l, bbls, wks 100 lb. | ... | 3.55 | ... | 3.55 | 3.15 | 3.40 |
| Chrome, bbls ....100 lb. | 6.50 | 6.75 | 6.50 | 6.75 | 6.50 | 7.25 |
| Potash, lump, c-l, bbls, wks ....100 lb. | 3.65 | 3.90 | 3.65 | 3.90 | 3.25 | 3.50 |
| Granular, c-l, bbls, wks ....100 lb. | 3.40 | 3.65 | 3.40 | 3.65 | 3.00 | 3.25 |
| Powd, c-l, bbls, wks 100 lb. | 3.80 | 4.05 | 3.80 | 4.05 | 3.40 | 3.65 |
| Soda, bbls, wks ....100 lb. | ... | 3.25 | ... | 3.25 | ... | 3.25 |
| Aluminum metal, c-l, NY 100 lb. | ... | 20.00 | ... | 20.00 | 19.00 | 20.00 |
| Acetate, 20%, bbls ....lb. | .07½ | .09 | .07½ | .10 | .09 | .10 |
| Basic powd, bbls, delv lb. | .40 | .50 | .40 | .50 | ... | ... |
| Chloride anhyd, 99%, wks lb. | .07 | .12 | .07 | .12 | .07 | .12 |
| 93%, wks ....lb. | .05 | .08 | .05 | .08 | .05 | .08 |
| Crystals, c-l, drs, wks lb. | .06 | .06¼ | .06 | .06¼ | .06 | .06¼ |
| Solution, drs, wks ....lb. | .02¾ | .03¼ | .02¾ | .03¼ | .02¾ | .03¼ |
| Formate, 30% sol bbls, c-l, delv ....lb. | ... | .13 | ... | .13 | ... | ... |
| **Hydrate, 96%, light, 90 lb bbls, delv** ....lb. | .12 | .13 | .12 | .13 | .13 | .15 |
| heavy, bbls, wks ....lb. | .029 | .03½ | .029 | .03½ | .029 | .03½ |
| Oleate, drs ....lb. | .16¾ | .18½ | .16¾ | .18½ | .16¾ | .18½ |
| Palmitate, bbls ....lb. | ... | .23 | ... | .23 | .22 | .23 |
| Resinate, pp., bbls ....lb. | ... | .15 | ... | .15 | ... | .15 |
| Stearate, 100 lb bbls ....lb. | .19 | .21 | .19 | .21 | .19 | .21 |
| Sulfate, com, c-l, bgs, wks ....100 lb. | ... | 1.15 | 1.15 | 1.35 | ... | 1.35 |
| c-l, bbls, wks ....100 lb. | ... | 1.35 | 1.35 | 1.55 | ... | 1.55 |
| Sulfate, iron-free, c-l, bgs, wks ....100 lb. | ... | 2.00 | ... | 2.00 | ... | 1.90 |
| c-l, bbls, wks ....100 lb. | ... | 2.20 | ... | 2.20 | ... | 2.05 |
| **Aminoazobenzene, 110 lb kgs** lb. | ... | 1.15 | ... | 1.15 | ... | 1.15 |
| **Ammonia anhyd fert com, tks** lb. | .04½ | .05½ | .04½ | .05½ | .04½ | .05½ |
| Ammonia anhyd, 100 lb cyl lb. | .16 | .22 | .16 | .22 | .16 | .22 |
| 26°, 800 lb drs, delv ....lb. | .02¼ | .02½ | .02¼ | .02½ | .02¼ | .02½ |
| Aqua 26°, tks, NH ...cont. | ... | .05 | ... | .05 | .04½ | .05 |
| tk wagon ....lb. | ... | .02 | ... | .02 | ... | .02 |
| Ammonium Acetate, kgs ..lb. | .26 | .33 | .26 | .33 | .26 | .33 |
| **Bicarbonate, bbls, f.o.b. wks** ....100 lb. | 5.15 | 5.71 | 5.15 | 5.71 | 5.15 | 5.71 |
| Bifluoride, 300 lb bbls ..lb. | .14½ | .16½ | .14½ | .17 | .16 | .17 |
| **carbonate, tech, 500 lb bbls** ....lb. | .08 | .12 | .08 | .12 | .08 | .12 |
| **Chloride, White, 100 lb bbls, wks** ....100 lb. | 4.45 | 4.90 | 4.45 | 4.90 | 4.45 | 4.90 |
| Gray, 250 lb bbls, wks ....100 lb. | 5.50 | 6.25 | 5.50 | 6.25 | 5.00 | 6.25 |
| Lump, 500 lbs cks spot lb. | .10½ | .11 | .10½ | .11 | .10½ | .11 |
| Lactate, 500 lb bbls ....lb. | .15 | .16 | .15 | .16 | .15 | .16 |
| Laurate, bbls ....lb. | ... | .23 | ... | .23 | ... | ... |
| Linoleate, 80% anhyd, bbls ....lb. | ... | .15 | ... | .15 | .11 | .15 |
| **Naphthenate, bbls** ....lb. | ... | .17 | ... | .17 | ... | ... |
| Nitrate, tech, cks ....lb. | .038 | .0405 | .038 | .0405 | .03¾ | .04 |
| Oleate, drs ....lb. | ... | .15 | ... | .15 | .15 | .10 |
| **Oxalate, neut, cryst, powd, bbls** ....lb. | .19 | .20 | .19 | .22½ | .22½ | .23 |
| Perchlorate, kgs ....lb. | ... | .16 | ... | .16 | ... | .16 |
| Persulfate, 112 lb kgs ..lb. | .21 | .24 | .21 | .24 | .21 | .24 |
| **Phosphate, dibasic tech, powd, 325 lb bbls** ....lb. | .07½ | .10 | .07½ | .10 | .07½ | .10 |
| Ricinoleate, bbls ....lb. | ... | .15 | ... | .15 | ... | ... |
| Stearate, anhyd, bbls ...lb. | ... | .24 | ... | .24 | ... | ... |
| Paste, bbls ....lb. | ... | .07½ | ... | .07½ | ... | ... |

*g* Grain alcohol 20c a gal. higher in each case.

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Ammonium (continued). | | | | | | |
| Sulfate, dom, f.o.b., bulk ton | ... | 27.00 | 26.50 | 28.50 | 26.00 | 28.00 |
| Sulfocyanide, pure, **kgs**..**lb.** | ... | .55 | ... | .55 | ... | .55 |
| **Amyl Acetate (from pentane)** | | | | | | |
| tks, delv ....lb. | ... | .10 | .10 | .11½ | ... | .11½ |
| tech, drs, delv ....lb. | ... | .11 | .11 | .12 | .11½ | .13½ |
| Secondary, tks, delv ..lb. | ... | .08½ | ... | .08½ | ... | .08½ |
| c-l, drs, delv ....lb. | ... | .09½ | ... | .09½ | ... | .09½ |
| tks, delv ....lb. | ... | .08½ | ... | .08½ | ... | .08½ |
| Chloride, norm, drs, wks lb. | .56 | .68 | .56 | .68 | .56 | .68 |
| mixed, drs, wks ....lb. | .07 | .077 | .07 | .077 | .07 | .077 |
| tks, wks ....lb. | ... | .06 | ... | .06 | ... | .06 |
| Mercaptan, drs, wks ....lb. | ... | 1.10 | ... | 1.10 | ... | 1.10 |
| Oleate, lcl, wks, drs ....lb. | ... | .25 | ... | .25 | ... | .25 |
| Stearate, lcl, wks, drs ..lb. | ... | .26 | ... | .26 | ... | .26 |
| Amylene, drs, wks ....lb. | .102 | .11 | .102 | .11 | .102 | .11 |
| tks, wks ....lb. | ... | .09 | ... | .09 | ... | .09 |
| **Aniline Oil, 960 lb drs and tks** ....lb. | .14½ | .17½ | .14½ | .17½ | .15 | .17½ |
| Annatto fine ....lb. | .34 | .37 | .34 | .37 | .34 | .37 |
| Anthracene, 80% ....lb. | ... | .75 | ... | .75 | ... | .75 |
| 40% ....lb. | ... | .18 | ... | .18 | ... | .18 |
| **Anthraquinone, sublimed, 125 lb bbls** ....lb. | ... | .65 | ... | .65 | .50 | .65 |
| **Antimony metal slabs, ton lots** ....lb. | ... | .11¼ | .10¾ | .14 | .13⅝ | .17¼ |
| **Butter of, see Chloride.** | | | | | | |
| Chloride, soln cbys ....lb. | ... | .17 | ... | .17 | ... | .17 |
| Needle, powd, bbls ....lb. | .12½ | .14 | .12½ | .16 | .14 | .19½ |
| Oxide, 500 lb bbls ....lb. | .11½ | .12½ | .11½ | .16½ | .14¼ | .16½ |
| Salt, 63% to 65%, tins lb. | .26 | .27 | .26 | .27 | .22 | .24 |
| Sulfuret, golden, bbls ..lb. | .22 | .23 | .22 | .23 | .22 | .23 |
| Archil, conc, 600 lb bbls ..lb. | .21 | .27 | .21 | .27 | .21 | .27 |
| **Double, 600 lb bbls** ....**lb.** | .18 | .20 | .18 | .20 | .18 | .20 |
| Aroclors, wks ....lb. | .18 | .30 | .18 | .30 | .18 | .30 |
| Arrowroot, bbl ....lb. | .08½ | .09 | .08½ | .09 | .08½ | .09¾ |
| Arsenic, Metal ....lb. | .40 | .41 | .40 | .44 | .42 | .44 |
| Red, 224 lb cs kgs ....lb. | ... | .15¾ | ... | .15¾ | ... | .15¾ |
| White, 112 lb kgs ....lb. | .03 | .03¾ | .03 | .04 | .03 | .04 |
| **Barium Carbonate precip,** 200 lb bgs, wks ....ton | 52.50 | 62.50 | 52.50 | 62.50 | 52.50 | 62.50 |
| **Nat (witherite) 90% gr,** c-l, wks, bgs ....ton | 41.00 | 43.00 | 41.00 | 44.00 | 42.00 | 45.00 |
| **Chlorate, 112 lb kgs, NY** lb. | .16½ | .17½ | .16½ | .17½ | .16½ | .17½ |
| Chloride, 600 lb bbls, delv, zone 1 ....ton | 77.00 | 92.00 | 77.00 | 92.00 | 74.00 | 92.00 |
| Dioxide, 88%, 690 lb drs lb. | .11 | .12 | .11 | .12 | .11 | .12 |
| Hydrate, 500 lb bbls ...lb. | .04¾ | .05½ | .04¾ | .05½ | .04¾ | .05½ |
| Nitrate, bbls ....**lb.** | .06¾ | .07¼ | .06¾ | .08¼ | .07 | .08¼ |
| **Barytes, floated, 350 lb bbls** c-l, wks ....**ton** | ... | 23.65 | ... | 23.65 | ... | 23.65 |
| Bauxite, bulk, mines ....ton | 7.00 | 10.00 | 7.00 | 10.00 | 7.00 | 10.00 |
| Bentonite, c-l, 325 mesh, bgs, **wks** ....**ton** | ... | 16.00 | ... | 16.00 | ... | 16.00 |
| 200 mesh ....ton | ... | 11.00 | ... | 11.00 | ... | 11.00 |
| **Benzaldehyde, tech, 945 lb** drs, wks ....lb. | .60 | .62 | .60 | .62 | .60 | .62 |
| **Benzene (Benzol), 90%, Ind,** 8000 gal tks, ft all'd..gal. | ... | .16 | ... | .16 | ... | .16 |
| 90% c-l, drs ....**gal.** | ... | .21 | ... | .21 | ... | .21 |
| Ind pure, tks, frt all'd gal. | ... | .16 | ... | .16 | ... | .16 |
| **Benzidine Base, dry, 250 lb** bbls ....lb. | .70 | .72 | .70 | .72 | .70 | .72 |
| Benzoyl Chloride, 500 lb drs lb. | .40 | .45 | .40 | .45 | .40 | .45 |
| Benzyl Chloride, 95-97% rfd, drs ....lb. | .30 | .40 | .30 | .40 | .30 | .40 |
| Tech, drs ....lb. | .25 | .26 | .25 | .26 | .25 | .26 |
| **Beta-Naphthol, 250 lb bbl,** wks ....lb. | .23 | .24 | .23 | .24 | .23 | .24 |
| **Naphthylamine, sublimed,** 200 lb bbls ....lb. | 1.25 | 1.35 | 1.25 | 1.35 | 1.25 | 1.35 |
| Tech, 200 lb bbls ....lb. | .51 | .52 | .51 | .52 | .51 | .52 |
| Bismuth metal ....lb. | 1.05 | 1.15 | 1.00 | 1.10 | 1.00 | 1.10 |
| Chloride, boxes ....lb. | 3.20 | 3.25 | 3.20 | 3.25 | 3.20 | 3.25 |
| **Hydroxide, boxes** ....**lb.** | 3.15 | 3.20 | 3.15 | 3.20 | 3.15 | 3.20 |
| Oxychloride, boxes ....lb. | ... | 2.95 | ... | 2.95 | 2.75 | 3.04 |
| Subbenzoate, boxes ....lb. | 3.25 | 3.30 | 3.25 | 3.30 | 3.25 | 3.30 |
| Subcarbonate, kgs ....lb. | 1.33 | 1.30 | 1.13 | 1.58 | 1.23 | 1.58 |
| Trioxide, powd, **boxes** ..lb. | | 3.57 | | 3.57 | 3.45 | 3.57 |
| Subnitrate, fibre, drs ...**lb.** | 1.18 | 1.20 | 1.03 | 1.48 | 1.22 | 1.48 |
| **Blackstrap, cane (see Molasses, Blackstrap).** | | | | | | |
| Blanc Fixe, 400 lb bbls, wks ton *h* | 40.00 | 75.00 | 40.00 | 75.00 | 40.00 | 75.00 |
| **Bleaching Powder, 800 lb drs,** c-l, wks, contract..100 lb. | ... | 2.00 | ... | 2.00 | ... | 2.00 |
| lcl, drs, wks ....lb. | 2.25 | 3.60 | 2.25 | 3.60 | 2.25 | 3.60 |
| Blood, dried, f.o.b., NY..unit | 2.75 | 2.80 | 2.50 | 3.10 | 3.10 | 4.30 |
| Chicago, high grade ...unit | ... | 2.75 | 2.35 | 3.35 | 3.00 | 4.65 |
| Imported shipt ....unit | ... | 3.10 | 2.90 | 3.45 | 3.25 | 4.10 |
| **Blues, Bronze Chinese Milori** Prussian Soluble ....lb. | .36 | .37 | .36 | .37 | .36 | .37 |
| **Ultramarine,* dry, wks,** bbls ....lb. | ... | .11 | ... | .11 | .10 | .11 |
| Regular grade, group 1 lb. | ... | .16 | ... | .16 | .15 | .16 |
| Special, group 1 ....lb. | ... | .19 | ... | .19 | .18 | .19 |
| Pulp, No. 1 ....lb. | ... | .27 | ... | .27 | .26 | .27 |
| **Bone, 4½ + 50% raw,** Chicago ....ton | 27.00 | 29.00 | 25.50 | 30.00 | 26.00 | 30.00 |
| **Bone Ash, 100 lb kgs** ....lb. | .06 | .07 | .06 | .07 | .06 | .07 |
| Black, 200 lb bbls ....lb. | .06½ | .08¼ | .06½ | .08¼ | .05½ | .08¼ |
| Meal, 3% & 50%, imp..ton | ... | 23.00 | 20.50 | 23.75 | 23.75 | 27.75 |
| Domestic, bgs, Chicago ton | 23.00 | 24.00 | 16.00 | 24.00 | 19.00 | 27.00 |
| **Borax, tech, gran, 80 ton lots,** sacks, delv ....ton *i* | ... | 43.00 | 42.00 | 43.00 | 40.00 | 42.00 |
| bbls, delv ....ton *i* | ... | 53.00 | 52.00 | 53.00 | 50.00 | 52.00 |

*h* Lowest price is for pulp, **highest for high grade precipitated;** *i* **Crystals** $6 per ton higher; USP, $15 higher in each case; * **Freight is equalized in each case with nearest producing point.**

# Prices—Current



| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Borax (continued): | | | | | | |
| Tech, powd, 80 ton lots, sacks ton i | ... | 47.00 | ... | 47.00 | 45.00 | 47.00 |
| bbls, delv ton i | ... | 57.00 | ... | 57.00 | 56.00 | 57.00 |
| Bordeaux Mixture, drs lb. | .11 | .11½ | .11 | .11½ | .10½ | .11 |
| Bromine, cases lb. | .30 | .43 | .30 | .43 | .30 | .43 |
| Bronze, Al, pwd, 300 lb drs lb. | .90½ | .92½ | .90½ | .92½ | .80 | 1.50 |
| Gold, blk lb. | .45 | .65 | .45 | .65 | .40 | .65 |
| **Butanes, com 16-32° group 3** tks lb. | .02¼ | .03¾ | .02¼ | .03¾ | .02¼ | .03¾ |
| Butyl, Acetate, norm drs, frt allowed lb. | .09½ | .10 | .09½ | .10½ | .10 | .10½ |
| tks, frt allowed lb. | ... | .08½ | .08½ | .09 | ... | .09 |
| **Secondary, tks, frt allowed** lb. | ... | .06½ | .06½ | .07 | .07 | .07½ |
| drs, frt, allowed lb. | .07½ | .08 | .07½ | .08½ | .08 | .09 |
| **Aldehyde, 50 gal drs, wks** lb. | .16½ | .17½ | .16½ | .17½ | .16½ | .17½ |
| Carbinol, norm drs, wks lb. | .60 | .75 | .60 | .75 | .60 | .75 |
| Crotonate, norm, 55 and 110 gal drs, delv lb. | ... | .36 | ... | .36 | ... | ... |
| Lactate lb. | .22½ | .23½ | .22½ | .23½ | .22½ | .23½ |
| Oleate, drs, frt allowed lb. | ... | .25 | ... | .25 | ... | .25 |
| Propionate, drs lb. | .18 | .18½ | .18 | .18½ | .18 | .18½ |
| tks, delv lb. | ... | .17 | ... | .17 | ... | .17 |
| Stearate, 50 gal drs lb. | ... | .26 | ... | .26 | .25 | .26 |
| Tartrate, drs lb. | .55 | .60 | .55 | .60 | .55 | .60 |
| Butyraldehyde, drs, lcl, wks lb. | ... | .35½ | ... | .35½ | ... | .35½ |
| Cadmium Metal lb. | ... | 1.05 | 1.05 | 1.60 | 1.05 | 1.60 |
| Sulfide, orange, boxes lb. | .90 | 1.05 | .90 | 1.60 | .90 | 1.60 |
| **Calcium, Acetate, 150 lb bgs** c-l, delv 100 lb. | ... | 1.65 | ... | 1.65 | 1.65 | 2.25 |
| Arsenate, c-l, E. of Rockies, dealers, drs lb. | .06¾ | .07¼ | .06¾ | .07¼ | .06¼ | .07¾ |
| Carbide, drs lb. | .05 | .06 | .05 | .06 | .05 | .06 |
| **Carbonate, tech, 100 lb bgs** c-l lb. | ... | 1.00 | ... | 1.00 | ... | 1.00 |
| **Chloride, flake, 375 lb drs,** | | | | | | |
| burlap bgs, c-l, delv ton | ... | 22.00 | 22.00 | 23.50 | 22.00 | 23.50 |
| paper bgs, c-l, delv ton | 23.00 | 36.00 | 23.00 | 36.00 | ... | ... |
| **Solid, 650 lb drs, c-l,** delv ton | ... | 20.00 | 20.00 | 21.50 | 20.00 | 21.50 |
| **Ferrocyanide, 350 lb bbls** wks lb. | ... | .17 | ... | .17 | ... | .17 |
| **Gluconate, Pharm, 125 lb** bbls lb. | .50 | .57 | .50 | .57 | .50 | .57 |
| Levulinate, less than 25 bbl lots, wks lb. | ... | 3.00 | ... | 3.00 | ... | ... |
| Nitrate, 100 lb bgs ton | ... | 28.00 | ... | 28.00 | 26.10 | 28.00 |
| Palmitate, bbls lb. | .22 | .23 | .22 | .23 | .22 | .23 |
| Phosphate, tribasic, tech, 450 lb bbls lb. | .06½ | .07½ | .06½ | .07½ | .06½ | .07½ |
| Resinate, precip, bbls lb. | .13 | .14 | .13 | .14 | .13 | .14 |
| Stearate, 100 lb bbls lb. | .19 | .21 | .19 | .21 | .19 | .21 |
| Camphor, slabs lb. | .52½ | .53 | .52½ | .56 | .54 | .56 |
| Powder lb. | .52½ | .53 | .52½ | .56 | .54 | .56 |
| Carbon Bisulfide, 500 lb drs lb. | .05 | .05¾ | .05 | .05¾ | .05 | .05¾ |
| Black, c-l, bgs, delv, price varying with zone† lb. | .027 | .0380 | .027 | .0380 | .0320 | .0535 |
| lcl, bgs, f.o.b. whse lb. | ... | .05¾ | ... | .05¾ | .06½ | .07 |
| cartons, f.o.b. whse lb. | ... | .06¼ | ... | .06¼ | .07 | .07¾ |
| cases, f.o.b. whse lb. | ... | .07 | ... | .07 | .07¾ | .08¼ |
| Decolorizing, drs, c-l lb. | .08 | .15 | .08 | .15 | .08 | .15 |
| Dioxide, Liq 20-25 lb cyl lb. | .06 | .08 | .06 | .08 | .06 | .08 |
| Tetrachloride, 55 or 110 gal drs, c-l, delv lb. | .05¼ | .06 | .05¼ | .06 | .05¼ | .06 |
| Casein, Standard, Dom, grd lb. | .10 | .12½ | .06½ | .13½ | .11 | .20¾ |
| 80-100 mesh, c-l, bgs lb. | .10½ | .13 | .07 | .14 | .11½ | .21¼ |
| Castor Pomace, 5½ $NH_3$, c-l, bgs, wks ton | ... | 18.50 | 18.50 | 21.00 | 21.00 | 25.00 |
| Imported, ship, bgs ton | ... | 21.00 | ... | 21.00 | nom. | 17.00 |
| Celluloid, Scraps, ivory cs lb. | .12 | .15 | .12 | .15 | .12 | .15 |
| Transparent, cs lb. | ... | .20 | ... | .20 | ... | .20 |
| **Cellulose, Acetate, 50 lb kgs** lb. | ... | .40 | ... | .40 | .40 | .55 |
| Chalk, dropped, 175 lb bbls lb. | .02¾ | .03¾ | .02¾ | .03¾ | .03 | .03¾ |
| Precip, heavy, 560 lb cks lb. | .02¾ | .03¼ | .02¼ | .04 | .03 | .04 |
| Light, 250 lb cks lb. | .03¼ | .04 | .03¼ | .04 | .03 | .04 |
| Charcoal, Hardwood, lump, blk, wks bu. | ... | .15 | ... | .15 | ... | .15 |
| Softwood, bgs, delv* ton | 23.00 | 34.00 | 23.00 | 34.00 | 23.00 | 34.40 |
| **Willow, powd, 100 lb bbl.** wks lb. | .06 | .07 | .06 | .07 | .06 | .07 |
| Chestnut, clarified, tks, wks lb. | ... | .01⅝ | .01⅝ | .02125 | .01625 | .02125 |
| 25%, bbls, wks lb. | ... | .02 | .02 | .0225 | .02 | .0225 |
| **Pwd, 60%, 100 lb bgs,** wks lb. | ... | .04½ | .04½ | .04⅞ | ... | .04⅞ |
| China Clay, c-l, blk mines ton | ... | 7.00 | ... | 7.00 | 6.50 | 7.00 |
| Imported, lump, blk ton | 22.00 | 25.00 | 22.00 | 25.00 | 22.00 | 25.00 |
| Chlorine, cyls, lcl, wks, contract lb. | .07½ | .08½ | .07½ | .08½ | .07½ | .08½ |
| cyls, c-l, contract lb. j | ... | .05½ | ... | .05½ | ... | .05½ |
| Liq, tk, wks, contract 100 lb. | ... | 2.15 | ... | 2.15 | ... | 2.15 |
| **Multi, c-l, cyls, wks, cont** lb. | 2.30 | 2.55 | 2.30 | 2.55 | 2.30 | 2.55 |
| **Chloroacetophenone, tins, wks** lb. | 3.00 | 3.50 | 3.00 | 3.50 | 3.00 | 3.50 |
| Chlorobenzene, Mono, 100 lb drs, lcl, wks lb. | .06 | .07½ | .06 | .07½ | .06 | .07½ |
| **Chloroform, tech, 1000 lb drs** lb. | .20 | .21 | .20 | .21 | .20 | .21 |
| USP, 25 lb tins lb. | .30 | .31 | .30 | .31 | .30 | .31 |
| Chloropicrin; comml cyls lb. | ... | .80 | ... | .80 | ... | .80 |
| Chrome, Green, CP lb. | .21 | .25 | .21 | .25 | .20 | .25 |
| Yellow lb. | .14½ | .15½ | .14½ | .15½ | .13 | .16½ |

*j* A delivered price; * Depends upon point of delivery; † New bulk price, tank cars ¼c per lb. less than bags in each zone.

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| **Chromium, Acetate, 8%** Chrome, bbls lb. | .05 | .08 | .05 | .08 | .05 | .08 |
| **Fluoride, powd, 400 lb bbl** lb. | .27 | .28 | .27 | .28 | .27 | .28 |
| Coal tar, bbls bbl. | 7.50 | 8.00 | 7.50 | 8.00 | 6.75 | 9.00 |
| Cobalt Acetate, bbls lb. | .65 | .67 | .65 | .68 | .58 | .68 |
| Carbonate tech, bbls lb. | ... | 1.63 | | 1.63 | 1.42¾ | 1.63 |
| Hydrate, bbls lb. | ... | 1.78 | 1.36 | 1.78 | ... | ... |
| Linoleate, solid, bbls lb. | ... | .33 | ... | .33 | .31 | .33 |
| paste, 6%, drs lb. | ... | .31 | ... | .31 | ... | .31 |
| Oxide, black, bgs lb. | ... | 1.67 | ... | 1.67 | 1.41 | 1.67 |
| Resinate, fused, bbls lb. | ... | .13½ | ... | .13½ | .13 | .13½ |
| Precipitated, bbls lb. | ... | .34 | ... | .34 | .30½ | .34 |
| Cochineal, gray or bk bgs lb. | .35 | .38 | .35 | .38 | .32 | .38 |
| Teneriffe silver, bgs lb. | .36 | .39 | .36 | .39 | .33 | .39 |
| Copper, metal, electrol 100 lb. | ... | 10.12½ | 9.00 | 11.00 | 11.00 | 16.25 |
| Acetate, normal, bbls, wks lb. | .21 | .23 | .21 | .23 | | |
| Carbonate, 400 lb bbls lb. | .10½ | .11½ | .10¼ | .11½ | .10½ | .12½ |
| 52-54% bbls lb. | .14 | .15 | .1340 | .16¾ | .15¾ | .19 |
| Chloride, 250 lb bbls lb. | .12½ | .13½ | .12½ | .17 | .15 | .18 |
| Cyanide, 100 lb drs lb. | ... | .34 | .34 | .38 | .37 | .38 |
| Oleate, precip, bbls lb. | ... | .20 | ... | .20 | ... | .20 |
| Oxide, black, bbls, wks lb. | .14¾ | .15¼ | .13½ | .17½ | .17 | .18 |
| red 100 lb bbls lb. | .15¼ | .16¼ | .15 | .19775 | .17 | .19975 |
| Resinate, precip, bbls lb. | .15 | .16 | .15 | .16 | .15 | .19 |
| Stearate, precip, bbls lb. | .23 | .24 | .23 | .24 | .23 | .40 |
| Sub-acetate verdigris, 400 lb bbls lb. | .18 | .19 | .18 | .19 | .18 | .19 |
| Sulfate, bbls, c-l, wks 100 lb. | ... | 4.25 | 4.00 | 4.25 | 4.25 | 4.50 |
| **Copperas, crys and sugar bulk** c-l, wks ton | ... | 13.00 | 12.00 | 13.00 | 12.00 | 13.00 |
| Corn Sugar, tanners, bbls 100 lb. | 3.00 | 3.10 | 3.00 | 3.30 | 3.15 | 4.34 |
| Corn Syrup, 42°, bbls 100 lb. | ... | 2.94 | 2.94 | 3.16 | 3.11 | 4.36 |
| 43°, bbls 100 lb. | ... | 2.99 | 2.99 | 3.21 | 3.16 | 4.41 |
| **Cotton, Soluble, wet, 100 lb** bbls lb. | .40 | .42 | .40 | .42 | .40 | .42 |
| Cream Tartar, powd & gran, 300 lb bbls lb. | .22¾ | .23¼ | .19¾ | .23¼ | .15 | .20¼ |
| Creosote, USP, 42 lb cbys lb. | .45 | .47 | .45 | .47 | .45 | .47 |
| Oil, Grade 1, tks gal. | .13½ | .14 | .13½ | .14 | .13 | .14 |
| Grade 2 gal. | .122 | .132 | .122 | .132 | .113 | .132 |
| Cresol, USP, drs lb. | .10½ | .11 | .10½ | .12½ | .10 | .13 |
| Crotonaldehyde, 97%, 55 and 110 gal drs, delv lb. | ... | .22 | .22 | .30 | .26 | .30 |
| Cutch, Philippine, 100 lb bale lb. | .04¼ | .04½ | .04 | .06 | .04 | .04¾ |
| **Cyanamid, bgs, c-l, frt allowed** Ammonia unit | ... | 1.15 | ... | 1.15 | 1.10 | 1.15 |
| **Derris root 5% rotenone,** bbls lb. | .34 | .38 | .34 | .43 | .39 | .47 |
| **Dextrin, corn, 140 lb bgs** f.o.b., Chicago 100 lb. | 3.35 | 3.55 | 3.35 | 3.75 | 3.50 | 5.00 |
| British Gum, bgs 100 lb. | 3.60 | 3.80 | 3.60 | 4.00 | 3.75 | 5.25 |
| Potato, Yellow, 220 lb bgs lb. | .07¼ | .08¾ | .07¼ | .08¾ | .07¾ | .08¾ |
| White, 220 lb bgs, lcl lb. | .08 | .09 | .08 | .09 | .08 | .09 |
| Tapioca, 200 bgs, lcl lb. | ... | .0715 | .0715 | .08 | ... | .08 |
| White, 140 lb bgs 100 lb. | 3.30 | 3.50 | 3.30 | 3.70 | 4.00 | 4.58 |
| Diamylamine, c-l, drs, wks lb. | .47 | .75 | .47 | .75 | .47 | .75 |
| Diamylene, drs, wks lb. | .095 | .102 | .095 | .102 | .095 | .102 |
| tks, wks lb. | ... | .08½ | ... | .08½ | ... | .08½ |
| Diamylether, wks, drs lb. | .085 | .092 | .085 | .092 | .085 | .092 |
| tks, wks lb. | ... | .075 | ... | .075 | ... | .075 |
| Oxalate, lcl, drs, wks lb. | ... | .30 | ... | .30 | ... | .30 |
| Diamylphthalate, drs, wks lb. | .20½ | .21 | .20½ | .21 | .19 | .21½ |
| Diamyl Sulfide, drs, wks lb. | ... | 1.10 | ... | 1.10 | ... | 1.10 |
| Diatomaceous Earth, see Kieselguhr. | | | | | | |
| **Dibutoxy Ethyl Phthalate,** drs, wks lb. | ... | .35 | ... | .35 | ... | .35 |
| Dibutylamine, lcl, drs, wks lb. | ... | .55 | ... | .55 | ... | ... |
| Dibutyl Ether, drs, wks, lcl lb. | ... | .30 | ... | .30 | ... | .30 |
| Dibutylphthalate, drs, wks, frt all'd lb. | ... | .21 | ... | .21 | .19½ | .21 |
| Dibutyltartrate, 50 gal drs lb. | .45 | .54 | .45 | .54 | .35 | .50 |
| Dichlorethylene, drs lb. | ... | .25 | ... | .25 | .25 | .29 |
| Dichloroethylether, 50 gal drs, wks lb. | .15 | .16 | .15 | .16 | .15 | .16 |
| tks, wks lb. | ... | .14 | ... | .14 | ... | .14 |
| Dichloromethane, drs, wks lb. | ... | .23 | ... | .23 | ... | .23 |
| Dichloropentanes, drs, wks lb. | no prices | | ... | ... | ... | ... |
| tks, wks lb. | no prices | | ... | ... | ... | ... |
| Diethanolamine, tks, wks lb. | ... | .23 | ... | .23 | .23 | .25 |
| Diethylamine, 400 lb drs lb. | 2.75 | 3.00 | 2.75 | 3.00 | 2.75 | 3.00 |
| Diethylaniline, 850 lb drs lb. | .40 | .52 | .40 | .50 | .40 | .50 |
| Diethyl Carbinol, drs lb. | .60 | .75 | .60 | .75 | .60 | .75 |
| Diethylcarbonate, com drs lb. | .31¾ | .35 | .31¾ | .35 | .31¾ | .35 |
| Diethylorthotoluidin, drs lb. | .64 | .67 | .64 | .67 | .64 | .67 |
| Diethylphthalate, 1000 lb drs lb. | .19 | .19½ | .19 | .19½ | .18 | .19½ |
| **Diethylsulfate, tech, drs, wks,** lcl lb. | .13 | .14 | .13 | .14 | .13 | .20 |
| Diethyleneglycol, drs lb. | .16 | .17 | .16 | .17 | .16 | .23 |
| Mono ethyl ethers, drs lb. | .15 | .16 | .15 | .16 | .15 | .17 |
| tks, wks lb. | ... | .14 | ... | .14 | .14 | .15 |
| Mono butyl ether, drs lb. | .23 | .24 | .23 | .24 | .23 | .26 |
| tks, wks lb. | ... | .22 | ... | .22 | ... | ... |
| **Diethylene oxide, 50 gal drs,** wks lb. | .20 | .24 | .20 | .24 | .20 | .24 |
| Diglycol Oleate, bbls lb. | ... | .21 | ... | .21 | .21 | .24 |
| Laurate, bbls lb. | ... | .27½ | ... | .27½ | ... | ... |
| Stearate, bbls lb. | ... | .27½ | ... | .27½ | ... | ... |
| **Dimethylamine, 400 lb drs, pure 25 & 40% sol 100%** basis lb. | ... | 1.00 | ... | 1.00 | ... | .95 |
| Dimethylaniline, 340 lb drs lb. | .26 | .27 | .26 | .27 | .26 | .27 |
| Dimethyl Ethyl Carbinol, drs lb. | .60 | .75 | .60 | .75 | .60 | .75 |
| Dimethyl phthalate, **drs, wks,** frt allowed lb. | ... | .19 | ... | .19 | .20½ | .21 |
| Dimethylsulfate, 100 lb drs lb. | .45 | .50 | .45 | .50 | .45 | .50 |
| Dinitrobenzene, 400 lb bbls lb. *k* | .16 | .19 | .16 | .19 | .16 | .19 |

*k* Higher price is for purified material.

## *Prices—Current*

**Dinitrochlorobenzene**
**Glauber's Salt**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| **Dinitrochlorobenzene, 400 lb** bbls ..................lb. | .13½ | .14 | .13½ | .14 | .14 | .17½ |
| **Dinitronaphthalene, 350 lb** bbls ..................lb. | .35 | .38 | .35 | .38 | .35 | .38 |
| Dinitrophenol, 350 lb bbls ..lb. | .23 | .24 | .23 | .24 | .23 | .24 |
| Dinitrotoluene, 300 lb bbls lb. | ... | .15½ | ... | .15½ | .14½ | .15½ |
| Diphenyl, bbls ............lb. | .15 | .25 | .15 | .25 | .15 | .25 |
| Diphenylamine ............lb. | .31 | .32 | .31 | .32 | .31 | .32 |
| **Diphenylguanidine, 100 lb drs** ..................lb. | .35 | .37 | .35 | .37 | .35 | .37 |
| **Dip Oil, see Tar Acid Oil.** | | | | | | |
| Divi Divi pods, bgs shipmt ton | . | nom. | ... | nom. | 34.00 | nom. |
| Extract ................lb. | .05¾ | .06¾ | .05 | .06¾ | .05 | .05½ |
| **EGG YOLK** | | | | | | |
| Egg Yolk, dom., 200 lb cases lb. | .62 | .64 | .60 | .68 | .68 | nom. |
| Imported ...............lb. | .64 | .65 | .62 | .68 | .53 | .65 |
| **Epsom Salt, tech, 300 lb bbls** | | | | | | |
| c-l, NY ..........100 lb. | 1.90 | 2.10 | 1.90 | 2.10 | 1.80 | 2.10 |
| USP, c-l, bbls ......100 lb. | ... | 2.10 | ... | 2.10 | 2.00 | 2.10 |
| **Ether, USP anaesthesia 55 lb** drs ..................lb. | .22 | .23 | .22 | .23 | .22 | .23 |
| (Conc) ...............lb. | .09 | .10 | .09 | .10 | .09 | .10 |
| Isopropyl 50 gal drs ....lb. | .07 | .08 | .07 | .08 | .07 | .08 |
| tks, frt allowed ......lb. | ... | .06 | ... | .06 | ... | .06 |
| Nitrous, conc, bottles ...lb. | ... | .68 | ... | .68 | .68 | .77 |
| Synthetic, wks, drs .....lb. | .08 | .09 | .08 | .09 | .08 | .09 |
| **Ethyl Acetate, 85% Ester** | | | | | | |
| tks, frt all'd .........lb. | ... | .05½ | ... | .05½ | .05½ | .06½ |
| drs, frt all'd .........lb. | ... | .06½ | ... | .06½ | .06½ | .07½ |
| 95%, tks, frt allowed ..lb. | ... | .06¾ | ... | .06¾ | ... | .06¾ |
| drs, frt all'd .........lb. | ... | .07¾ | ... | .07¾ | ... | .07¾ |
| Acetoacetate, 110 gal drs lb. | ... | .27½ | ... | .27½ | ... | .27½ |
| Benzylaniline, 300 lb drs lb. | .86 | .88 | .86 | .88 | .86 | .88 |
| Bromide, tech, drs .....lb. | .50 | .55 | .50 | .55 | .50 | .55 |
| **Cellulose, drs, wks, frt** all'd ................lb. | .6440 | .9440 | .6440 | 1.00 | ... | ... |
| Chloride, 200 lb drs ....lb. | .22 | .24 | .22 | .24 | .22 | .24 |
| Chlorocarbonate, cbys ...lb. | ... | .30 | ... | .30 | ... | .30 |
| Crotonate, drs .........lb. | 1.00 | 1.25 | 1.00 | 1.25 | 1.00 | 1.25 |
| Formate, drs, frt all'd ..lb. | .27 | .28 | .27 | .28 | .27 | .31 |
| Lactate, drs, wks .......lb. | ... | .33 | ... | .33 | ... | .33 |
| Oxalate, drs, wks ......lb. | .30 | .34 | .30 | .34 | .30 | .34 |
| **Oxybutyrate, 50 gal drs,** wks ................lb. | .30 | .30½ | .30 | .30½ | .30 | .30½ |
| Silicate, drs, wks ......lb. | ... | .77 | ... | .77 | ... | .77 |
| **Ethylene Dibromide, 60 lb** drs ..................lb. | .65 | .70 | .65 | .70 | .65 | .70 |
| Chlorhydrin, 40%, 10 gal cbys chloro, cont .....lb. | .75 | .85 | .75 | .85 | .75 | .85 |
| Anhydrous ...........lb. | ... | .75 | ... | .75 | ... | .75 |
| Dichloride, 50 gal drs, wks lb. | .0545 | .0994 | .0545 | .0994 | .0545 | .0994 |
| Glycol, 50 gal drs, wks ..lb. | .17 | .21 | .17 | .21 | .17 | .21 |
| tks, wks ............lb. | ... | .16 | ... | .16 | ... | .16 |
| Mono Butyl Ether, drs, wks ..............lb. | .20 | .21 | .20 | .21 | .20 | .21 |
| tks, wks ..........lb. | ... | .19 | ... | .19 | ... | .19 |
| Mono Ethyl Ether, drs, wks ..............lb. | .16 | .17 | .16 | .17 | .16 | .17 |
| tks, wks ..........lb. | ... | .15 | ... | .15 | ... | .15 |
| Mono Ethyl Ether Acetate, drs, wks ......lb. | ... | .14 | ... | .14 | ... | .14 |
| tks, wks ..........lb. | ... | .13 | ... | .13 | ... | 13 |
| **Mono, Methyl Ether, drs** wks ..............lb. | .18 | .22 | .18 | .22 | .18 | .22 |
| tks, wks ..........lb. | ... | .17 | ... | .17 | ... | .17 |
| Oxide, cyl ..........lb. | .50 | .55 | .50 | .55 | .50 | .55 |
| Ethylidenaniline .........lb. | .45 | .47½ | .45 | .47½ | .45 | .47½ |
| Feldspar, blk pottery .....ton | 17.00 | 19.00 | 17.00 | 19.00 | ... | 14.50 |
| Powd, blk, wks ........ton | 14.00 | 14.50 | 14.00 | 14.50 | 14.00 | 14.50 |
| **Ferric Chloride, tech, crys,** 475 lb bbls ..........lb. | .05 | .07½ | .05 | .07½ | .05 | .07½ |
| sol, 42° cbys .........lb. | .06¼ | .06½ | .06¼ | .06½ | .06¼ | .06½ |
| **Fish Scrap, dried, unground,** wks ............unit *l* | ... | 3.25 | 2.75 | 3.25 | ... | ... |
| Acid, Bulk, 6 & 3%, delv Norfolk & Baltimore basis ..................unit *m* | ... | 2.75 | 2.50 | 2.50 | 2.75 | 3.15 |
| Fluorspar, 98%, bgs ......lb. | ... | 33.00 | ... | 33.00 | no prices | |
| **Formaldehyde, USP, 400 lb** bbls, wks ...........lb. | .05¾ | .06¼ | .05¾ | .06¼ | .05¾ | .06¼ |
| Fossil Flour .............lb. | .02½ | .04 | .02½ | .04 | .02¼ | .04 |
| Fullers Earth, blk, mines ..ton | 10.00 | 11.00 | 10.00 | 11.00 | 6.50 | 15.00 |
| Imp powd, c-l, bgs .....ton | 23.00 | 30.00 | 23.00 | 30.00 | 23.00 | 30.00 |
| Furfural (tech) drs, wks ..lb. | .10 | .15 | .10 | .15 | .10 | .15 |
| **Furfuramide (tech) 100 lb** drs ..................lb. | ... | .30 | ... | .30 | ... | .30 |
| Fusel Oil, 10% impurities lb. | .12½ | .14 | .12½ | .14 | .12½ | .18 |
| **Fustic, crystals, 100 lb** boxes ...............lb. | .22 | .26 | .22 | .26 | .20 | .26 |
| Liquid 50°, 600 lb bbls ..lb. | .09½ | .13 | .09½ | .13 | .08½ | .13 |
| Solid, 50 lb boxes ......lb. | .17½ | .19½ | .17½ | .19½ | .16 | .19½ |
| **G SALT PASTE** | | | | | | |
| G Salt paste, 360 lb bbls ...lb. | .45 | .47 | .45 | .47 | .45 | .47 |
| Gall Extract .............lb. | .19 | .20 | .19 | .20 | .19 | .20 |
| Gambier, com 200 lb bgs ..lb. | .06¾ | .07¾ | .06¾ | .07¾ | ... | nom. |
| **Singapore cubes, 150 lb** bgs ..............100 lb. | .08½ | .09 | .08½ | .11 | .09½ | .10½ |
| Gelatin, tech, 100 lb cs ...lb. | .45 | .50 | .45 | .50 | .45 | .55 |
| **Glauber's Salt, tech, c-l, bgs,** wks* ............100 lb. | .95 | 1.15 | .95 | 1.15 | .95 | 1.15 |
| **Anhydrous, see Sodium Sulfate.** | | | | | | |

*l* + 10; *m* + 50; ***Bbls. are 20c higher.**

| | | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|---|
| **Glue, bone, com grades, c-l** bgs | lb. | .13 | .16½ | .13 | .16½ | .11 | .17½ |
| Better grades, c-l, bgs | lb. | .14½ | .16½ | .14½ | .16½ | .12½ | .17½ |
| Glycerin, CP, 550 lb drs | lb. | ... | .14¼ | .14¼ | .16 | .15½ | .29 |
| Dynamite, 100 lb drs | lb. | .12¾ | .13¼ | .12¾ | .16 | .15½ | .29 |
| Saponification, drs | lb. | .09½ | .09¾ | .09½ | .11¼ | .11 | .29 |
| Soap Lye, drs | lb. | .08½ | .08¾ | .08½ | .10¼ | .10 | .27 |
| Glyceryl Bori-Borate, bbls | lb. | ... | .40 | ... | .40 | ... | ... |
| Monoricinoleate, bbls | lb. | ... | .27 | ... | .27 | ... | ... |
| Monostearate, bbls | lb. | ... | .30 | ... | .30 | ... | ... |
| Oleate, bbls | lb. | ... | .22 | ... | .22 | ... | ... |
| Phthalate | lb. | ... | .37 | ... | .37 | .29 | .37 |
| Glyceryl Stearate, bbls | lb. | ... | .18 | ... | .18 | ... | .18 |
| Glycol Bori-Borate, bbls | lb. | ... | .26 | ... | .26 | ... | ... |
| Phthalate, drs | lb. | ... | .40 | ... | .40 | .29 | .40 |
| Stearate, drs | lb. | ... | .27½ | ... | .27½ | .23 | .27½ |

## GUMS

| | | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|---|
| Gum Aloes, Barbadoes | lb. | .85 | .90 | .85 | .90 | .85 | .90 |
| Arabic, amber sorts | lb. | .09½ | .09¾ | .09¼ | .12 | .10½ | .15½ |
| White sorts, No. 1, bgs | lb. | .23 | .24 | .23 | .28 | .24 | .30 |
| No. 2, bgs | lb. | .21 | .22 | .21 | .26 | .22 | .28 |
| Powd, bbls | lb. | .12 | .12½ | .12 | .16 | .14 | .19 |
| **Asphaltum, Barbadoes (Manjak) 200 lb bgs, f.o.b.,** NY | lb. | 02½ | .10½ | .02½ | .10½ | .02½ | .10½ |
| California, f.o.b., NY, drs | ton | 29.00 | 55.00 | 29.00 | 55.00 | 29.00 | 55.00 |
| **Egyptian, 200 lb cases,** f.o.b., NY | lb. | .12 | .15 | .12 | .15 | .12 | .15 |
| **Benzoin Sumatra, USP, 120** lb cases | lb. | .23 | .25 | .15 | .25 | .15 | .25 |
| **Copal, Congo, 112 lb bgs,** clean, opaque | lb. | ... | .18¾ | .18¾ | .19¼ | .18⅞ | .19¼ |
| Dark amber | lb. | ... | .07½ | .07½ | .08⅞ | .06⅞ | .09¼ |
| Light amber | lb. | ... | .11⅞ | .11⅞ | .13¼ | .10¼ | .14⅜ |
| **Copal, East India, 180 lb bgs** | | | | | | | |
| Macassar pale bold | lb. | ... | .12⅛ | .12⅛ | .13 | ... | .13 |
| Chips | lb. | . | .05⅜ | .. | .05⅜ | .05⅜ | .06½ |
| Dust | lb. | .03¼ | .04 | .03½ | .04⅛ | .03⅝ | .04⅛ |
| Nubs | lb. | ... | .10 | .10 | .10⅜ | .10⅜ | .11¼ |
| Singapore, Bold | lb. | ... | .14½ | .14½ | .15¼ | .15¼ | .15⅝ |
| Chips | lb. | ... | .05⅜ | .04¾ | .05⅜ | .04¼ | .05 |
| Dust | lb. | .03¼ | .04 | .03¼ | .04⅛ | .03⅝ | .04⅛ |
| Nubs | lb. | ... | .10 | ... | .10 | .10 | .10¾ |
| **Copal Manilla, 180-190 lb** baskets, Loba A | lb. | ... | .11¼ | .11¼ | .12 | .09¾ | .12 |
| Loba B | lb. | ... | .10¼ | .10¼ | .11⅝ | .09¼ | .11⅝ |
| Loba C | lb. | ... | .09¾ | .09¾ | .11¼ | .08⅞ | .11¼ |
| DBB | lb. | ... | .08 | .08 | .08¾ | .08 | .08¾ |
| Dust | lb. | ... | .05⅜ | .05⅜ | .06⅝ | .05¾ | .06⅝ |
| MA sorts | lb. | ... | .06⅛ | .05⅞ | .07¼ | .06¾ | .07¼ |
| **Copal Pontianak, 224 lb cases,** bold genuine | lb. | ... | .15¼ | .15¼ | .16½ | .15½ | .16½ |
| Chips | lb. | ... | .08⅝ | .08⅝ | .10¼ | .09⅛ | .11⅛ |
| Mixed | lb. | ... | .14 | | .14 | .13½ | .14 |
| Nubs | lb. | ... | .11¾ | .11¾ | .12⅞ | .12¾ | .13½ |
| Split | lb. | . | .13⅞ | .. | .13⅞ | .13½ | .15¼ |
| **Dammar Batavia, 136 lb cases** | | | | | | | |
| A | lb. | ... | .20⅞ | .20⅞ | .25½ | .23½ | .25½ |
| B | lb. | ... | .19⅜ | .19⅜ | .24 | .22⅛ | .24 |
| C | lb. | ... | .16⅝ | .16⅝ | .20⅜ | .18½ | .20⅜ |
| D | lb. | ... | .13¾ | .13¾ | .17½ | .15¼ | .17½ |
| A/D | lb. | ... | .16⅛ | .16⅛ | .20⅜ | .17⅝ | .20⅜ |
| A/E | lb. | ... | .13⅝ | .13⅝ | .17¼ | .14⅞ | .17¼ |
| E | lb. | ... | .07⅜ | .07⅜ | .08½ | .07½ | .08½ |
| F | lb. | ... | .07¼ | .. | .07¼ | .06¼ | .07¼ |
| Singapore, No. 1 | lb. | ... | .15⅝ | .15⅝ | .21⅛ | .17⅛ | .21½ |
| No. 2 | lb. | ... | .10⅜ | .10⅜ | .15⅜ | .14⅛ | .16¼ |
| No. 3 | lb. | ... | .05 | .05 | .05¾ | ... | .05¾ |
| Chips | lb. | ... | .10⅝ | .10⅝ | .13½ | .10¼ | .13½ |
| Dust | lb. | ... | .05 | .05 | .05¾ | .05¾ | .06 |
| Seeds | lb. | ... | .07¾ | .07¾ | .09½ | .07⅛ | .09½ |
| Elemi, cns., c.l. | lb. | ... | .08⅛ | .08⅛ | .09½ | .09⅜ | .10¼ |
| Ester | lb. | .06¾ | .07½ | .06¾ | .08½ | .09 | .12 |
| Gamboge, pipe, cases | lb. | .65 | .70 | .65 | .80 | .58 | .80 |
| Powd, bbls | lb. | .70 | .75 | .70 | .85 | .65 | .85 |
| Ghatti, sol. bgs | lb. | .11 | .15 | .11 | .15 | .11 | .15 |
| Karaya, bbls., bxs., drs., | lb. | .14½ | .23 | ... | ... | ... | ... |
| **Kauri, NY,** | | | | | | | |
| Brown XXX, cases | lb. | .60 | .60½ | .60 | .60½ | .60 | .60½ |
| BX | lb. | ... | .38 | ... | .38 | .33 | .38 |
| B1 | lb. | ... | .28 | ... | .28 | .21 | .28 |
| B2 | lb. | ... | .24 | ... | .24 | .15½ | .26 |
| B3 | lb. | ... | .18½ | ... | .18½ | .12 | .18½ |
| Pale XXX | lb. | ... | .61 | ... | .61 | .61 | .65½ |
| No. 1 | lb. | ... | .41 | ... | .41 | .40 | .41 |
| No. 2 | lb. | ... | .24 | ... | .24 | .22 | .24 |
| No. 3 | lb. | ... | .17¾ | ... | .17¾ | .15 | .17¾ |
| Kino, tins | lb. | 2.50 | 2.75 | 2.00 | 2.75 | .70 | 2.10 |
| Mastic | lb. | .55 | .56 | .55 | .56 | .55 | .58 |
| **Sandarac, prime quality, 200** lb bgs & 300 lb cks | lb. | .25 | .26 | .24 | .26 | .25 | .35 |
| Senegal, picked bags | lb. | .25 | .27 | .23 | .27 | .20 | .29 |
| Sorts | lb. | .09¼ | .09½ | .09¼ | .12 | .09¾ | .15 |
| Thus, bbls | 280 lbs. | 14.00 | 14.25 | 13.50 | 14.25 | 12.00 | 14.00 |
| Strained | 280 lbs. | 14.00 | 14.25 | . | 14.25 | 12.00 | 14.00 |
| Tragacanth, No. 1, cases | lb. | 2.65 | 2.70 | 2.65 | 3.00 | 2.40 | 3.25 |
| No. 2 | lb. | 2.35 | 2.40 | 2.35 | 2.75 | 2.00 | 2.75 |
| No. 3 | lb. | 2.30 | 2.35 | 2.30 | 2.70 | 1.95 | 2.70 |
| No. 4 | lb. | 2.25 | 2.30 | 2.25 | 2.65 | 1.85 | 2.65 |
| No. 5 | lb. | 2.20 | 2.25 | 2.20 | 2.50 | 1.65 | 2.50 |
| Yacca, bgs | lb. | .03½ | .04½ | .03½ | .04½ | .03¼ | .04½ |
| Helium, cyl (200 cu. ft.) | cyl. | ... | 25.00 | ... | 25.00 | ... | 25.00 |
| Hematine crystals, 400 lb bbls | lb. | .18 | .34 | .18 | .34 | .16 | .34 |
| **Hemlock, 25%, 600 lb bbls,** wks | lb. | .03 | .03¼ | .03 | .03¼ | .03 | .03¼ |
| tks | lb. | ... | .02⅝ | .02⅝ | .02¾ | ... | .02¾ |

# *Current*

**Hexalene**
**Manganese Sulfate**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Hexalene, 50 gal drs, wks lb. | ... | .30 | ... | .30 | ... | .30 |
| **Hexane, normal 60-70° C.** | | | | | | |
| Group 3, tks ........gal. | ... | .10½ | ... | .10½ | ... | .10½ |
| **Hexamethylenetetramine,** | | | | | | |
| powd, drs ...........lb. | .35 | .36 | .35 | .36 | .35 | .36 |
| **Hexyl Acetate, secondary,** | | | | | | |
| delv, drs ............lb. | .13 | .13½ | .13 | .13½ | .13 | .13½ |
| tks .................lb. | ... | .12 | ... | .12 | ... | .12 |
| Hoof Meal, f.o.b. Chicago unit | ... | 2.50 | 2.35 | 3.35 | 3.20 | 3.75 |
| **Hydrogen Peroxide, 100 vol,** | | | | | | |
| 140 lb cbys ...........lb. | .19½ | .20 | .19½ | .20 | .20 | .21 |
| Hydroxylamine Hydrochloride | | | | | | |
| .......................lb. | ... | 3.15 | ... | 3.15 | ... | 3.15 |
| Hypernic, 51°, 600 lb bbls lb. | .16 | .21 | .16 | .21 | .15 | .21 |
| **INDIGO** | | | | | | |
| Indigo, Bengal, bbls ......lb. | .... | 2.40 | ... | 2.40 | ... | 2.40 |
| Synthetic, liquid .......lb. | .16½ | .19 | .16½ | .19 | .16½ | .19 |
| Iodine, Resublimed, jars .lb. | ... | 1.75 | 1.50 | 1.75 | 1.50 | 1.60 |
| Irish Moss, ord, bales ....lb. | .10 | .11 | .10 | .11 | .11 | .12 |
| Bleached, prime, bales .lb. | .19 | .20 | .19 | .20 | .19 | .21 |
| Iron Acetate Liq. 17°, bbls. | | | | | | |
| delv ................lb. | .03 | .04 | .03 | .04 | .03 | .04 |
| Chloride see Ferric Chloride. | | | | | | |
| Nitrate, coml, bbls ..100 lb. | 2.32 | 3.11 | 2.32 | 3.11 | 2.32 | 3.25 |
| **Isobutyl Carbinol (128-132° C)** | | | | | | |
| drs, wks ............lb. | .33 | .34 | .33 | .34 | .33 | .34 |
| tks, wks ..............lb. | ... | .32 | ... | .32 | ... | .32 |
| **Isopropyl Acetate, tks, frt** | | | | | | |
| all'd ................lb. | ... | .05½ | ... | .05½ | .05½ | .06½ |
| drs, frt all'd ...........lb. | .06½ | .07 | .06½ | .07 | .06½ | .08 |
| Ether, see Ether, isopropyl. | | | | | | |
| Keiselguhr, dom bags, c-l, | | | | | | |
| Pacific Coast .........ton | 22.00 | 85.00 | 22.00 | 85.00 | 22.00 | 85.00 |
| **LEAD ACETATE** | | | | | | |
| **Lead Acetate, f.o.b. NY, bbls,** | | | | | | |
| White, broken .......lb. | ... | .10 | .10 | .11 | .11 | .13½ |
| cryst, bbls ..........lb. | ... | .10 | .10 | .11 | .11 | .13½ |
| gran, bbls ...........lb. | ... | .10¾ | .10¾ | .11¾ | .11¾ | .14¼ |
| powd, bbls ..........lb. | ... | .10¾ | .10¾ | .11¾ | .11¾ | .14¼ |
| Arsenate, East, drs .....lb. | .12½ | .13 | .12½ | .13½ | .11 | .13½ |
| Linoleate, solid, bbls ...lb. | ... | .19 | ... | .19 | .18 | .19 |
| Metal, c-l, NY .....100 lb. | ... | 4.95 | 4.00 | 4.95 | 4.75 | 7.05 |
| Nitrate, 500 lb bbls, wks lb. | .10 | .11½ | .10 | .11½ | .09 | .11½ |
| Oleate, bbls ............lb. | .18½ | .20 | .18½ | .20 | .15 | .20 |
| **Red, dry, 95% $Pb_3O_4$,** | | | | | | |
| delv ................lb. | ... | .074 | .06½ | .074 | .07¼ | .0945 |
| 97% $Pb_3O_4$, delv .....lb. | ... | .0765 | .06¾ | .0765 | .07½ | .09¾ |
| 98% $Pb_3O_4$, delv .....lb. | ... | .079 | .07 | .0790 | .07¾ | .10 |
| Resinate, precip, bbls ...lb. | ... | .16½ | ... | .16½ | .14 | .16½ |
| Stearate, bbls ..........lb. | .22 | .23 | .22 | .23 | .22 | .23 |
| **Titanate, bbls, c-l, f.o.b.** | | | | | | |
| wks, frt all'd ........lb. | .11 | .11½ | .11 | .11½ | .10 | .12 |
| White, 500 lb bbls, wks lb. | ... | .06¾ | .06 | .06¾ | .06¾ | .09 |
| **Basic sulfate, 500 lb bbls,** | | | | | | |
| wks ..................lb. | ... | .06 | .05¼ | .06¼ | .06¼ | .08¾ |
| **Lime, chemical quicklime,** | | | | | | |
| f.o.b., wks, bulk .....ton | 7.00 | 8.00 | 7.00 | 8.00 | 6.00 | 8.00 |
| Hydrated, f.o.b., wks ..ton | 8.50 | 12.00 | 8.50 | 12.00 | 8.00 | 12.00 |
| **Lime Salts, see Calcium Salts.** | | | | | | |
| Lime sulfur, dealers, tks..gal. | .08 | .11½ | .08 | .11½ | ... | .11 |
| drs ..................gal. | .11 | .16 | .11 | .16 | .13 | .16 |
| Linseed Meal, bgs .......ton | ... | 42.00 | 39.00 | 45.00 | 35.00 | 42.50 |
| Litharge, coml, delv, bbls..lb. | ... | .064 | .05½ | .064 | .06¼ | .08½ |
| **Lithopone, dom, ordinary,** | | | | | | |
| delv, bgs.............lb. | ... | .04⅛ | .04⅛ | .04⅝ | .04¼ | .04⅝ |
| bbls ................lb. | ... | .04⅜ | .04⅜ | .04⅞ | .04½ | .04⅞ |
| High strength, bgs .....lb. | ... | .05⅝ | .05⅝ | .06⅛ | .05¾ | .06⅛ |
| bbls ................lb. | ... | .05⅞ | .05⅞ | .06⅜ | .06 | .06⅜ |
| Titanated, bgs .........lb. | ... | .05⅝ | .05⅝ | .06⅛ | .05¾ | .06⅛ |
| bbls ................lb. | ... | .05⅞ | .05⅞ | .06⅜ | .06 | .06⅜ |
| Logwood, 51°, 600 lb bbls..lb. | .09½ | .11½ | .09½ | .11½ | .08½ | .11½ |
| Solid, 50 lb boxes ......lb. | .15 | .19 | .15 | .19 | .15 | .17½ |
| Sticks ..................ton | 24.00 | 25.00 | 24.00 | 25.00 | 24.00 | 25.00 |
| **MADDER** | | | | | | |
| Madder, Dutch ..........lb. | .22 | .25 | .22 | .25 | .22 | .25 |
| Magnesite, calc, 500 lb bbl ton | 60.00 | 65.00 | 60.00 | 65.00 | 60.00 | 65.00 |
| **Magnesium Carb, tech, 70 lb** | | | | | | |
| bgs, wks ...............lb. | .05¾ | .06½ | .05¾ | .07 | .06 | .07 |
| **Chloride flake, 375 lb drs,** | | | | | | |
| c-l, wks ..............ton | 39.00 | 42.00 | 39.00 | 42.00 | 39.00 | 42.00 |
| **Fluosilicate, crys, 400 lb** | | | | | | |
| bbls, wks .............lb. | .10 | .10½ | .10 | .10½ | .10 | .10½ |
| Oxide, calc tech. heavy bbls, | | | | | | |
| frt all'd ...........**lb.** | .25 | .30 | .25½ | .30½ | ... | ... |
| Light, bbls, above basis lb. | .20 | .25 | .20 | .25½ | ... | ... |
| USP Heavy, bbls, above | | | | | | |
| basis ...............**lb.** | .25 | .30 | .25 | .30½ | ... | ... |
| Palmitate, bbls ........lb. | .33 | nom. | ... | .33 | .33 | nom. |
| Silicofluoride, bbls .....lb. | .09½ | .10½ | .09½ | .10½ | .09½ | .10½ |
| Stearate, bbls ..........lb. | .21 | .24 | .21 | .24 | .21 | .24 |
| Manganese acetate, drs ...lb. | ... | .26½ | ... | .26½ | .25½ | .26½ |
| Borate, 30%, 200 lb bbls lb. | .15 | .16 | .15 | .16 | .15 | .16 |
| Chloride, 600 lb cks ....lb. | .09 | .12 | .09 | .12 | .09 | .12 |
| **Dioxide, tech (peroxide),** | | | | | | |
| paper bgs, c-l .......ton | ... | 57.50 | 57.50 | 62.50 | 47.50 | 62.50 |
| Hydrate, bbls ..........lb. | ... | .32 | ... | .32 | ... | .32 |
| Linoleate, liq, drs ......lb. | .18 | .19¼ | .18 | .19¼ | .18 | .19¼ |
| solid, precip, bbls ....lb. | ... | .19 | ... | .19 | .17½ | .19 |
| Resinate, fused, bbls ....lb. | .08¼ | .08½ | .08¼ | .08½ | .08¼ | .08½ |
| precip, drs ..........**lb.** | ... | .12 | ... | .12 | ... | .12 |
| **Sulfate, tech, anhyd, 90-** | | | | | | |
| 95%, 550 lb drs .....lb. | .07 | .07½ | .07 | .07½ | .07 | .07½ |

## *Prices*

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Mangrove, 55%, 400 lb bbls lb. | ... | .04 | ... | .04 | ... | .04 |
| Bark, African ........ton | ... | 24.50 | 24.50 | 25.50 | 25.00 | 27.00 |
| Mannitol, pure cryst, cs, wks lb. | ... | 1.30 | 1.30 | 1.45 | 1.45 | 1.48 |
| Marble Flour, blk ......ton | 12.00 | 13.00 | 12.00 | 13.00 | 12.00 | 13.00 |
| Mercury chloride (Calomel) lb. | ... | 1.28 | 1.18 | 1.59 | 1.05 | 1.60 |
| Mercury metal ...76 lb. flasks | ... | 75.00 | 75.00 | 84.50 | 81.00 | 99.00 |
| Meta-nitro-aniline lb. | .67 | .69 | .67 | .69 | .67 | .69 |
| Meta-nitro-paratoluidine 200 lb bbls ...... lb. | 1.45 | 1.55 | 1.45 | 1.55 | 1.45 | 1.55 |
| Meta-phenylene diamine 300 lb bbls ............lb. | .80 | .84 | .80 | .84 | .60 | .84 |
| Meta-toluene-diamine, 300 lb bbls ..............lb. | .65 | .67 | .65 | .67 | .65 | .67 |
| Methanol, denat, grd, drs, c-l, frt all'd .........gal. | ... | .31 | .31 | .36 | .36 | .53 |
| tks, frt all'd ........gal. | ... | .25 | .25 | .30 | .30 | .48 |
| Pure, drs, c-l, frt all'd gal. | ... | .38 | ... | .38 | .. | .38 |
| tks ...............gal. | ... | .33 | ... | .33 | ... | .33 |
| 95%, tks ............gal. | ... | .31 | ... | .31 | ... | .31 |
| 97%, tks ............gal. | ... | .32 | ... | .32 | .. | .32 |
| Methyl Acetate, tech, tks, delv ..............lb. | ... | .06½ | ... | .06½ | ... | ... |
| 55 gal drs, delv ......lb. | .07½ | .08 | .07½ | .08 | ... | ... |
| C.P. 97-99%, tks, delv lb. | ... | .07 | ... | .07 | ... | ... |
| 55 gal drs, delv ......lb. | .08 | .08½ | .08 | .08½ | ... | ... |
| Acetone, frt all'd, drs gal. *p* | .30 | .36 | .30 | .40½ | .34½ | .58½ |
| tks, frt all'd, drs ...gal. *p* | .25 | .29 | .25 | .32½ | .28½ | .44½ |
| Synthetic, frt all'd, east of Rocky M., drs ..........gal. *p* | .42 | .51 | .42 | .51 | .42 | .59½ |
| tks, frt all'd ...gal. | .36 | .39½ | .36 | .39½ | .36 | .49½ |
| West of Rocky M., frt all'd, drs ..gal. *p* | ... | .46 | ... | .46 | .46 | .58 |
| tks, frt all'd ..gal. *p* | ... | .39½ | ... | .39½ | .39½ | .51 |
| Anthraquinone ........lb. | .65 | .67 | .65 | .67 | .65 | .67 |
| Butyl Ketone, tks ......lb. | ... | .10½ | ... | .10½ | ... | .10½ |
| Chloride, 90 lb cyl .....lb. | .32 | .40 | .32 | .40 | .32 | .43 |
| Ethyl Ketone, tks, frt all'd lb. | ... | .05½ | .05½ | .06 | ... | .07½ |
| 50 gal drs, frt all'd c-l..lb. | ... | .06½ | .06½ | .07 | ... | ... |
| Formate, drs, frt all'd ..lb. | .35 | .36 | .35 | .36 | .35 | .39 |
| Hexyl Ketone, pure, drs lb. | ... | .60 | ... | .60 | ... | .60 |
| Lactate, drs, frt all'd ...lb. | ... | .30 | ... | .30 | ... | .30 |
| Propyl carbinol, drs ....lb. | .60 | .75 | .60 | .75 | .60 | .75 |
| Mica, dry grd, bgs, wks ...lb. | ... | 35.00 | ... | 35.00 | ... | 35.00 |
| Michler's Ketone, kgs ....lb. | ... | 2.50 | ... | 2.50 | ... | 2.50 |
| Molasses, blacksrap, tks, f.o.b. NY ..........gal. | ... | .07 | ... | .07 | .07 | .07¼ |
| Monoamylamine, c-l, drs, wks lb. | .52 | 1.00 | .52 | 1.00 | .52 | 1.00 |
| Monobutylamine, lcl, drs, wks ................lb. | ... | .65 | ... | .65 | ... | ... |
| Monochlorobenzene, see Chlorobenzene, mono. | | | | | | |
| Monoethanolamine, tks, wks lb. | ... | .23 | ... | .23 | .25 | .30 |
| Monomethylamine, drs, frt all'd, E. Mississippi, c-l lb. | ... | .65 | ... | .65 | ... | .65 |
| Monomethylparaminosulfate, 100 lb drs ..........lb. | 3.75 | 4.00 | 3.75 | 4.00 | 3.75 | 4.00 |
| Myrobalans 25%, liq bbls..lb. | .03¾ | .04¼ | .03¾ | .04¼ | ... | .04¼ |
| 50% Solid, 50 lb boxes..lb. | .04⅜ | .05 | .04⅜ | .06¼ | .06 | .06¼ |
| J1 bgs ..............ton | ... | 27.50 | 27.00 | 30.00 | 26.50 | 30.00 |
| J2 bgs ..............ton | ... | 19.50 | 19.50 | 22.00 | 19.00 | 22.50 |
| R2 bgs ..............ton | ... | 17.00 | 17.00 | 22.00 | 18.75 | 22.00 |
| **NAPHTHA** | | | | | | |
| Naphtha, v.m.&p. (deodorized) see petroleum solvents. | | | | | | |
| Naphtha, Solvent, water-white, tks ..................gal. | ... | .26 | .26 | .31 | ... | .31 |
| drs, c-l .............gal. | ... | .31 | .31 | .36 | ... | .36 |
| **NAPHTHALENE** | | | | | | |
| Naphthalene, dom, crude, bgs, wks ................lb. | 2.35 | 2.85 | 2.35 | 2.85 | 2.00 | 3.00 |
| Imported, cif, bgs ....lb. | 1.50 | 2.05 | 1.50 | 2.25 | 2.20 | 3.00 |
| Balls, flakes, pks .......lb. | ... | .07½ | .07½ | .08 | ... | .08 |
| Balls, ref'd, bbls, wks ..lb. | ... | .06¾ | .06¾ | .07¼ | ... | .07¼ |
| Flakes, ref'd, bbls, wks..lb. | ... | .06¾ | .06¾ | .07¼ | ... | .07¼ |
| Nickel Carbonate, bbls ....lb. | .36 | .37½ | .36 | .37½ | .36 | .37½ |
| Chloride, bbls .........lb. | .18 | .20 | .18 | .20 | .18 | .20 |
| Metal ingot ............lb. | ... | .35 | ... | .35 | ... | .35 |
| Oxide, 100 lb kgs, NY..lb. | .35 | .37 | .35 | .37 | .35 | .37 |
| Salt, 400 lb bbls, NY ...lb. | .13 | .13½ | .13 | .13½ | .13 | .13½ |
| Single, 400 lb bbls, NY lb. | .13 | .13½ | .13 | .13½ | .13 | .13½ |
| Nicotine, 40%, drs, sulfate, 55 lb drs ............lb. | ... | .76 | ... | .76 | ... | .76 |
| Nitre Cake, blk ........ton | ... | 16.00 | ... | 16.00 | ... | 16.00 |
| Nitrobenzene, redistilled, 1000 lb drs, wks ......... lb. | .08 | .10 | .08 | .10 | .08 | .10 |
| tks ...............lb. | ... | .07½ | ... | .07½ | ... | .07½ |
| Nitrocellulose, c-l, l-c-l, wks lb. | .22 | .29 | .22 | .29 | .26 | .29 |
| Nitrogen Sol. 45½% ammon., f.o.b. Atlantic & Gulf ports, tks, unit ton ............ | ... | 1.00 | ... | ... | ... | ... |
| Nitrogenous Mat'l, bgs, imp unit | ... | 2.65 | 2.35 | 2.65 | 2.55 | 3.55 |
| dom, Eastern wks .....unit | ... | 2.65 | 2.50 | 2.75 | 2.50 | 4.25 |
| dom, Western wks ....unit | ... | 2.35 | 2.20 | 2.35 | 2.25 | 3.75 |
| Nitronaphthalene, 550 lb bbls lb. | .24 | .25 | .24 | .25 | .24 | .25 |
| Nutgalls Alleppo, bgs .....lb. | no prices | | ... | ... | .20 | .22 |
| Chinese, bgs ..........lb. | no prices | | ... | ... | .20 | .22 |
| **OAK BARK** | | | | | | |
| Oak Bark Extract, 25%, bbls lb. | ... | .03⅛ | ... | .03⅛ | ... | .03⅛ |
| tks ..................lb. | ... | .02¾ | ... | .02¾ | ... | .02¾ |
| Octyl Acetate, tks, wks ...lb. | .16 | .17 | .16 | .17 | .16 | .17 |

*o* Country is divided in 4 zones, prices varying by zone; *p* Country is divided into 4 zones. Also see footnote directly above; *q* Naphthalene quoted on Pacific Coast F.A.S. Phila. or N. Y.

# *Current*

**Orange-Mineral**
**Phenylhydrazine Hydrochloride**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| **Orange-Mineral, 1100 lb cks** NY ..........lb. | ... | .10¼ | .09½ | .10¼ | :10¼ | .12¾ |
| **Orthoaminophenol, 50 lb kgs** lb. | 2.15 | 2.25 | 2.15 | 2.25 | 2.15 | 2.25 |
| Orthoanisidine, 100 lb drs lb. | .70 | .74 | .70 | .74 | .70 | .74 |
| Orthochlorophenol, drs ....lb. | .35 | .75 | .35 | .75 | .35 | .75 |
| Orthocresol, drs, wks .....lb. | .13½ | .14½ | .13½ | .14½ | .13½ | .14½ |
| Orthodichlorobenzene, 1000 lb drs ......lb. | .06 | .07 | .06 | .07 | .05 | .07 |
| **Orthonitrochlorobenzene, 1200** lb drs, wks ........lb. | .15 | .18 | 15 | .18 | .28 | .29 |
| Orthonitroparachlorphenol, tins ............lb. | ... | .75 | ... | .75 | .70 | .75 |
| **Orthonitrophenol, 350 lb drs** ........lb. | .85 | .90 | .85 | .90 | .85 | .90 |
| Orthonitrotoluene, 1000 lb drs, wks .........lb. | .08 | .10 | .08 | .10 | .07 | .10 |
| **Orthotoluidine, 350 lb bbls,** l-c-l ..............lb. | .16 | .17 | .16 | .17 | .14 | .17 |
| **Osage Orange, cryst, bbls** ..lb. | .17 | .25 | .17 | .25 | .17 | .25 |
| 51° liquid ...........lb. | .07 | .08 | .07 | .08 | .07 | .08 |
| Paraffin, rfd, 200 lb bgs | | | | | | |
| 122-127° M P ........lb. | .03¾ | .039 | .03¾ | .04½ | .0445 | .04½ |
| 128 132° M P ........lb. | .04 | .0435 | .04 | .049 | .04¾ | .049 |
| 133-137° M P ........lb. | ... | .0465 | .0465 | .05¾ | .05½ | .05¾ |
| Para aldehyde, 99%, tech, 110-55 gal drs, delv ..lb. | ... | .16 | .16 | .18 | .16 | .18 |
| **Aminoacetanilid, 100 lb** kgs lb. | ... | .85 | ... | .85 | ... | .85 |
| **Aminohydrochloride, 100 lb** kgs ..........lb. | 1.25 | 1.30 | 1.25 | 1.30 | 1.25 | 1.30 |
| Aminophenol, 100 lb kgs lb. | ... | 1.05 | ... | 1.05 | ... | 1.05 |
| Chlorophenol, drs lb. | .30 | .45 | .30 | .45 | .30 | .45 |
| **Dichlorobenzene, 200 lb drs,** wks ..........lb. | .11 | .12 | .11 | .12 | .11 | .20 |
| Formaldehyde, drs, wks lb. | .34 | .35 | .34 | .35 | .34 | .35 |
| **Nitroacetanilid, 300 lb bbls** ........lb. | .45 | .52 | .45 | .52 | .45 | .52 |
| **Nitroaniline, 300 lb bbls,** wks ......lb. | .45 | .47 | .45 | .47 | .45 | .47 |
| **Nitrochlorobenzene, 1200** lb drs, wks .....lb. | .15 | .16 | .15 | .16 | .23½ | .24 |
| **Nitro-orthotoluidine, 300 lb** bbls ..........lb. | 2.75 | 2.85 | 2.75 | 2.85 | 2.75 | 2.85 |
| Nitrophenol, 185 lb bbls lb. | .35 | .37 | .35 | .37 | .35 | .37 |
| **Nitrosodimethylaniline, 120** lb bbls ........lb. | .92 | .94 | .92 | .94 | .92 | .94 |
| Nitrotoluene, 350 lb bbls lb. | ... | .35 | ... | .35 | ... | .35 |
| Phenylenediamine, 350 lb bbls ..........lb. | 1.25 | 1.30 | 1.25 | 1.30 | 1.25 | 1.30 |
| **Toluenesulfonamide, 175 lb** bbls ............lb. | .70 | .75 | .70 | .75 | .70 | .75 |
| tks, wks ...........lb. | ... | .31 | ... | .31 | ... | .31 |
| **Toluenesulfonchloride, 410** lb bbls, wks .....lb. | .20 | .22 | .20 | .22 | .20 | .22 |
| **Toluidine, 350 lb bbls, wks** ..........lb. | .56 | .58 | .56 | .58 | .56 | .58 |
| Paris Green, dealers, drs..lb. | .23 | .26 | .23 | .26½ | .22 | .26½ |
| **Pentane, normal, 28-38° C,** group 3, tks .......gal. | ... | .08½ | ... | .08½ | .08½ | .09½ |
| drs, group 3 .......gal. | .11½ | .16 | .11½ | .16 | .12½ | .16 |
| **Perchlorethylene, 100 lb drs,** frt all'd ......lb. | ... | .10½ | ... | .10½ | ... | .10½ |
| **Petrolatum, dark amber, bbls** ..................lb. | .02⅝ | .02¾ | .02⅝ | .03⅞ | .02⅝ | .03 |
| Light, bbls ..........lb. | .03⅛ | .03⅜ | .03⅛ | .03⅜ | .03⅛ | .03⅜ |
| Medium, bbls ..........lb. | .02⅞ | .03⅛ | .02⅞ | .03⅛ | .02⅞ | .03⅛ |
| Dark green, bbls ......lb. | .02½ | .02¾ | .02½ | .02¾ | .02½ | .02¾ |
| Red, bbls ..........lb. | .02½ | .03⅝ | .02½ | .03⅝ | .02⅛ | .03¾ |
| White, lily, bbls ......lb. | .05¼ | .07⅛ | .05¼ | .07⅛ | .06 | .06¼ |
| White, snow, bbls .....lb. | .06¼ | .08⅛ | .06¼ | .08⅛ | .07 | .07¼ |
| **Petroleum Ether, 30-60°,** group 3, tks ........gal. | ... | .13 | ... | .13 | ... | .13 |
| drs, group 3 ..........gal. | .14 | .17 | .14 | .17 | .15 | .17 |
| PETROLEUM SOLVENTS AND DILUENTS | | | | | | |
| **Cleaners naphthas, group 3,** tks, wks .........gal. | .06⅜ | .06⅝ | .06⅜ | .07⅜ | .06⅞ | .07⅞ |
| East Coast, tks, wks gal. | ... | .10 | ... | .10 | .09½ | 10 |
| **Hydrogenated, naphthas, frt** all'd East, tks ......gal. | ... | .16 | ... | .16 | ... | .16 |
| **No. 2, tks ..........gal.** | ... | .18 | ... | .18 | ... | .18 |
| No. 3, tks ..........gal. | ... | .16 | ... | .16 | ... | .16 |
| No. 4, tks ..........gal. | ... | .18 | ... | .18 | ... | .18 |
| Lacquer diluents, tks, Bayonne ...........gal. | .12 | .12½ | .12 | .12½ | .12 | .12½ |
| Group 3, tks .......gal. | .07⅜ | .07⅝ | .07⅜ | .08⅜ | .07⅞ | .08⅞ |
| **Naphtha, V.M.P., East, tks,** wks ...............gal. | | .10 | .10 | .11 | .10 | .11 |
| Group 3, tks, wks ...gal. | .06⅜ | .06⅝ | .06⅜ | .07⅜ | .06⅞ | .07⅞ |
| Petroleum thinner, 43-47, East, tks, wks ......gal. | .09 | .10 | .09 | .10 | .09 | .10 |
| Group 3, tks, wks ...gal. | ... | .05⅜ | .05⅜ | .06⅜ | .05⅞ | .06⅞ |
| **Rubber Solvents, stand grd,** East, tks, wks ......gal. | .09½ | .10 | .09½ | .10 | .09½ | .10 |
| Group 3, tks, wks ...gal. | .06⅜ | .06⅝ | .06⅜ | .07⅜ | .06⅞ | .07⅞ |
| **Stoddard Solvent, East, tks, wks** ...............gal. | ... | .10 | .09½ | .10 | .09½ | .10 |
| Group 3, tks, wks ...gal. | .05⅞ | .06⅛ | .05⅞ | .06⅞ | .06⅜ | .07⅜ |
| Phenol, 250-100 lb drs ....lb. | .14½ | .15½ | .14½ | .15½ | .13¼ | .15½ |
| tks, wks ..............lb. | ... | .13½ | ... | .13½ | .12¾ | .13½ |
| **Phenyl-Alpha-Naphthylamine,** 100 lb kgs ..........lb. | ... | 1.35 | ... | 1.35 | ... | 1.35 |
| Phenyl Chloride, drs .....lb. | ... | .17 | ... | .17 | .16 | .17 |
| **Phenylhydrazine Hydrochloride, com** ...........lb. | ... | 1.50 | ... | 1.50 | ... | 1.50 |

**Phloroglucinol**
**Rosin Oil**

# Prices

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Phloroglucinol, tech, tins ... lb. | 15.00 | 16.50 | 15.00 | 16.50 | 15.00 | 16.50 |
| CP, tins ... lb. | 20.00 | 22.00 | 20.00 | 22.00 | 20.00 | 22.00 |
| **Phosphate Rock, f.o.b. mines** | | | | | | |
| Florida Pebble, 68% basis ton | ... | 1.85 | ... | 1.85 | ... | 1.85 |
| 70% basis ... ton | ... | 2.35 | ... | 2.35 | ... | 2.35 |
| 72% basis ... ton | ... | 2.85 | ... | 2.85 | ... | 2.85 |
| 75-74% basis ... ton | ... | 3.85 | ... | 3.85 | ... | 3.85 |
| 75% basis ... ton | ... | 5.50 | ... | 5.50 | ... | 5.50 |
| Tennessee, 72% basis ton | ... | 4.50 | ... | 4.50 | ... | 4.50 |
| **Phosphorus Oxychloride 175** | | | | | | |
| lb cyl ... lb. | .16 | .20 | .16 | .20 | .16 | .20 |
| Red, 110 lb cases ... lb. | .40 | .44 | .40 | .44 | .40 | .44 |
| Sesquisulfide, 100 lb cs ... lb. | .38 | .44 | .38 | .44 | .38 | .44 |
| Trichloride, cyl ... lb. | .15 | .18 | .15 | .18 | .15 | .20 |
| Yellow, 110 lb cs, wks ... lb. | .24 | .30 | .24 | .30 | .24 | .33 |
| **Phthalic Anhydride, 100 lb** | | | | | | |
| drs, wks ... lb. | ... | .14½ | ... | .14½ | .14½ | .15½ |
| **Pine Oil, 55 gal drs or bbls** | | | | | | |
| Destructive dist ... lb. | .52 | .55 | .52 | .55 | .49 | .65 |
| Steam dist wat wh bbls gal. | ... | .59 | ... | .59 | .59 | .79 |
| tks ... gal. | ... | .54 | ... | .54 | .54 | .74 |
| Pitch Hardwood, wks ... ton | 18.25 | 18.75 | 18.25 | 18.75 | 15.00 | 18.75 |
| Coaltar, bbls, wks ... ton | ... | 19.00 | ... | 19.00 | ... | 19.00 |
| Burgundy, dom, **bbls, wks** lb. | .05½ | .06½ | .05½ | .06½ | .03½ | .06½ |
| Imported ... lb. | .15 | .16 | .15 | .16 | .11 | .16 |
| Petroleum, **see Asphaltum in Gums' Section.** | | | | | | |
| Pine, bbls ... bbl. | 6.00 | 6.25 | 5.75 | 6.25 | 5.75 | 6.50 |
| Stearin, drs ... lb. | .03 | .04½ | .03 | .04½ | .03 | .04½ |
| Platinum, ref'd ... oz. | 36.00 | 38.00 | 32.00 | 38.00 | 32.00 | 68.00 |

POTASH

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| **Potash, Caustic, wks, sol** ... lb. | .06¼ | .06½ | .06¼ | .06½ | .06¼ | .06½ |
| flake ... lb. | .07 | .07⅜ | .07 | .07⅜ | .07 | .07⅜ |
| Liquid, tks ... lb. | ... | .02⅞ | ... | .02⅞ | ... | .02⅞ |
| **Manure Salts, imported** | | | | | | |
| 30% basis, blk ... unit | ... | .58½ | ... | .58½ | .55 | .58½ |
| Potassium Abietate, bbls ... lb. | ... | .08 | .08 | .13 | ... | ... |
| Acetate, tech, bbls, delv lb. | ... | .26 | .26 | .28 | .26 | .28 |
| **Bicarbonate, USP, 320 lb** | | | | | | |
| bbls ... lb. | ... | .18 | ... | .18 | .09 | .18 |
| **Bichromate Crystals, 725 lb** | | | | | | |
| cks* ... lb. | .08¾ | .09¼ | .08¾ | .09¼ | .08¾ | .09 |
| Binoxalate, 300 lb bbls ... lb. | ... | .23 | ... | .23 | ... | .23 |
| Bisulfate, 100 lb kgs ... lb. | .15½ | .18 | .15½ | .18 | .15½ | .18 |
| **Carbonate, 80-85% calc 800** | | | | | | |
| lb cks ... lb. | .06½ | .07 | .06½ | .07 | .06½ | .07 |
| liquid, tks ... lb. | ... | .02⅞ | ... | .02⅞ | .02¾ | .02⅞ |
| drs, wks ... lb. | .03 | .03½ | .03 | .03½ | .02⅞ | .03½ |
| Chlorate **crys, 112 lb kgs,** | | | | | | |
| wks ... lb. | .09¼ | .09½ | .09¼ | .09½ | .09¼ | .09½ |
| gran, kgs ... lb. | .12 | .13 | .12 | .13 | .12 | .13 |
| powd, kgs ... lb. | .08½ | .08¾ | .08½ | .08¾ | .08½ | .08¾ |
| Chloride, crys, bbls ... lb. | .04 | .04¾ | .04 | .04¾ | .04 | .04¾ |
| Chromate, kgs ... lb. | .19 | .28 | .19 | .28 | .28 | .29 |
| Cyanide, 110 lb cases ... lb. | .50 | .55 | .50 | .57½ | .55 | .57½ |
| Iodide, 250 lb bbls ... lb. | ... | 1.13 | .93 | 1.13 | .93 | 1.15 |
| Metabisulfite, 300 lb bbls lb. | .12 | .13½ | .12 | .15 | .11 | .15 |
| Muriate, bgs, dom, blk unit | ... | .53½ | ... | .53½ | .50 | .53½ |
| Oxalate, bbls ... lb. | .25 | .26 | .25 | .26 | .25 | .26 |
| Perchlorate, kgs, wks ... lb. | .09 | .10½ | .09 | .11½ | .09½ | .11 |
| **Permanganate, USP, crys,** | | | | | | |
| 500 & 1000 lb drs, wks lb. | .18½ | .19½ | .18½ | .19½ | .18½ | .19½ |
| Prussiate, red, bbls ... lb. | .30½ | .34 | .30½ | .37 | .35 | .37 |
| Yellow, bbls ... lb. | .15 | .16 | .15 | .16 | .15 | .18 |
| Sulfate, 90% basis, bgs ton | ... | 38.00 | ... | 38.00 | ... | 36.25 |
| **Titanium Oxalate, 200 lb** | | | | | | |
| bbls ... lb. | .35 | .40 | .35 | .40 | .33 | .40 |
| **Pot & Mag Sulfate, 48% basis** | | | | | | |
| bgs ... ton | ... | 25.75 | ... | 25.75 | 24.75 | 25.75 |
| Propane, group 3, tks ... lb. | .03 | .04⅜ | .03 | .04⅜ | .03 | .04⅜ |
| Putty, coml, tubs ... 100 lb. | ... | 3.00 | 2.25 | 3.00 | 2.90 | 3.00 |
| Linseed Oil, kgs ... 100 lb. | ... | 4.50 | 4.00 | 4.65 | 4.65 | 4.75 |
| **Pyrethrum, conc liq:** | | | | | | |
| 2.4% pyrethrins, drs, frt | | | | | | |
| all'd ... gal. | 6.40 | 6.75 | 5.00 | 6.75 | 4.15 | 5.25 |
| 3.6% pyrethrins, drs, frt | | | | | | |
| all'd ... gal. | 9.60 | 9.95 | 7.65 | 9.95 | 6.10 | 7.85 |
| **Flowers, coarse, Japan,** | | | | | | |
| bgs ... lb. | ... | .27 | .18 | .28½ | .12¾ | .18 |
| Fine powd, bbls ... lb. | ... | .28 | .19 | .30 | .14 | .19 |
| Pyridine, denat, 50 gal drs gal. | ... | 1.53 | 1.53 | 1.55 | 1.30 | 1.55 |
| Refined, drs ... lb. | ... | .45 | ... | .45 | ... | ... |
| **Pyrites, Spanish cif Atlantic** | | | | | | |
| ports, blk ... unit | .12 | .13 | .12 | .13 | .12 | .13 |
| Pyrocatechin, CP, drs, tins lb. | 2.15 | 2.75 | 2.15 | 2.75 | 2.15 | 2.75 |
| Quebracho, 35% liq tks ... lb. | ... | .03⅜ | .03 | .03⅜ | .02⅞ | .03 |
| 450 lb bbls, c-l ... lb. | ... | .04⅛ | .03½ | .04⅛ | .03½ | .03⅞ |
| Solid, 63%, **100 lb bales** | | | | | | |
| cif ... lb. | ... | .04 | ... | .04 | .03⅞ | .04 |
| Clarified, 64%, bales lb. | ... | .04¼ | ... | .04¼ | .04¼ | .04⅜ |
| **Quercitron, 51 deg liq, 450 lb** | | | | | | |
| bbls ... lb. | .07½ | .08½ | .06 | .08½ | .06 | .06½ |
| Solid, drs ... lb. | .10 | .12 | .10 | .12 | .10 | .12 |

R SALT

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| R Salt, 250 lb bbls, wks ... lb. | .52 | .55 | .52 | .55 | .52 | .55 |
| Resorcinol tech, cans ... lb. | .75 | .80 | .75 | .80 | .75 | .80 |
| Rochelle Salt, cryst ... lb. | .17¾ | .18¼ | .15 | .18¼ | .14½ | .15½ |
| Powd, bbls ... lb. | .16¾ | .17¼ | .16 | .18½ | .13½ | .16½ |
| Rosin Oil, bbls, first run gal. | .45 | .47 | .45 | .60 | .52 | .73 |
| Second run ... gal. | .47 | .49 | .47 | .62 | .54 | .75 |
| Third run, drs ... gal. | .51 | .53 | .51 | .66 | .58 | .79 |

* Spot price is ⅛c higher.

## *Current*

**Rosins**
**Sodium Naphthionate**

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| **Rosins 600 lb bbls, 280 lb unit ex. yard NY:†** | | | | | | |
| B | ... | 4.75 | 4.65 | 6.00 | 5.50 | 10.00 |
| D | ... | 5.10 | 4.90 | 6.00 | 5.50 | 10.35 |
| E | ... | 5.45 | 4.95 | 6.00 | 5.75 | 10.25 |
| F | ... | 5.62½ | 5.30 | 7.00 | 6.87½ | 10.80 |
| G | ... | 5.62½ | 5.50 | 7.05 | 6.87½ | 10.85 |
| H | ... | 5.62½ | 5.55 | 7.15 | 6.90 | 10.85 |
| I | 5.62½ | 5.65 | 5.60 | 7.15 | 6.95 | 10.90 |
| K | ... | 5.62½ | 5.65 | 7.25 | 6.95 | 10.90 |
| M | 5.62½ | 5.62½ | 5.65 | 7.40 | 7.05 | 11.00 |
| N | ... | 6.50 | 6.20 | 7.50 | 7.10 | 11.05 |
| WG | ... | 6.85 | 6.80 | 8.45 | 7.65 | 11.75 |
| WW | ... | 7.75 | 7.70 | 9.15 | 8.00 | 13.75 |
| **Rosins, Gum, Savannah (280 lb unit):†** | | | | | | |
| B | ... | 3.50 | 3.25 | 4.60 | 4.25 | 8.75 |
| D | ... | 3.85 | 3.50 | 4.60 | 4.25 | 9.00 |
| E | ... | 4.20 | 3.55 | 4.60 | 4.25 | 9.10 |
| F | ... | 5.30 | 3.90 | 5.60 | 5.50 | 9.55 |
| G | ... | 5.30 | 4.10 | 5.65 | 5.60 | 9.60 |
| H | ... | 5.30 | 4.20 | 5.75 | 5.70 | 9.60 |
| I | ... | 5.30 | 4.20 | 5.85 | 5.70 | 9.65 |
| K | ... | 5.30 | 4.20 | 6.00 | 5.70 | 9.65 |
| M | ... | 4.35 | 4.20 | 6.15 | 5.80 | 9.75 |
| N | ... | 5.20 | 4.80 | 6.20 | 5.85 | 9.75 |
| WG | ... | 5.40 | 5.40 | 7.05 | 6.40 | 10.50 |
| WW | ... | 6.30 | 6.10 | 7.75 | 6.75 | 12.50 |
| X | ... | 6.30 | 6.10 | 7.75 | 6.75 | 12.50 |
| Rosin, Wood, c-l, FF grade, NY | ... | 5.10 | 5.05 | 6.40 | 6.40 | 10.72 |
| **Rotten Stone, bgs mines ..ton** | ... | 35.00 | ... | 35.00 | ... | 35.00 |
| Imported, lump, bbls ...lb. | ... | .12 | ... | .12 | ... | ... |
| Powdered, bbls ......lb. | .08½ | .10 | .08½ | .10 | ... | ... |

### SAGO FLOUR

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Sago Flour, 150 lb bgs ...lb. | .02½ | .03½ | .02½ | .03¾ | .02¾ | .03¾ |
| Sal Soda, bbls, wks ...100 lb. | ... | 1.20 | ... | 1.20 | 1.15 | 1.20 |
| **Salt Cake, 94-96%, c-l, wks ton** | 19.00 | 23.00 | 19.00 | 23.00 | 19.00 | 23.00 |
| Chrome, c-l, wks ......ton | 11.00 | 12.00 | 11.00 | 12.00 | 11.00 | 12.00 |
| **Saltpetre, gran, 450-500 lb bbls ......lb.** | .06½ | .069 | .06½ | .069 | .06 | .069 |
| Cryst, bbls ............lb. | .07½ | .0865 | .07½ | .0865 | .07 | .0865 |
| Powd, bbls ............lb. | .07½ | .079 | .07½ | .079 | .07 | .079 |
| **Satin, White, pulp, 550 lb bbls ......lb.** | .01¼ | .01½ | .01¼ | .01½ | .01¼ | .01½ |
| Schaeffer's Salt, kgs ......lb. | .46 | .48 | .46 | .48 | .46 | .48 |
| Shellac, Bone dry, bbls ..lb. r | .19 | .20 | .16½ | .20 | .17 | .22 |
| Garnet, bgs ..........lb. | .13½ | .14 | .13½ | .15 | .14 | .17 |
| Superfine, bgs ........lb. s | .11½ | .12 | .11½ | .13½ | .13 | .18½ |
| T. N., bgs ............lb. s | .11 | .11½ | .11 | .12½ | .12 | .14½ |
| Silver Nitrate, vials ......oz. | .31½ | .33½ | .33½ | .34⅞ | .32⅝ | .35½ |
| **Slate Flour, bgs, wks ....ton** | 9.00 | 10.00 | 9.00 | 10.00 | 9.00 | 10.00 |
| **Soda Ash, 58% dense, bgs, c-l, wks ........100 lb.** | ... | 1.10 | ... | 1.10 | ... | 1.10 |
| 58% light, bgs ......100 lb. | ... | 1.08 | ... | 1.08 | ... | 1.08 |
| blk ..............100 lb. | ... | .90 | ... | .90 | ... | .90 |
| paper bgs ........100 lb. | ... | 1.05 | ... | 1.05 | ... | 1.05 |
| bbls ..............100 lb. | ... | 1.35 | ... | 1.35 | ... | 1.35 |
| **Caustic, 76% grnd & flake, drs ..............100 lb.** | ... | 2.70 | ... | 2.70 | ... | 2.70 |
| 76% solid, drs .....100 lb. | ... | 2.30 | ... | 2.30 | ... | 2.30 |
| Liquid sellers, tks ..100 lb. | ... | 1.97½ | ... | 1.97½ | ... | 1.97½ |
| Sodium Abietate, drs ......lb. | ... | .10 | .10 | .13 | .08 | .13 |
| Acetate, 60% tech, gran, powd, flake, 450 lb bbls, wks ..............lb. | .04 | .05 | .04 | .05 | .04¼ | .05 |
| anhyd, drs, delv .....lb. | ... | .08¼ | ... | .08¼ | ... | ... |
| Alignate, drs ..........lb. | ... | .69 | ... | .69 | .64 | .69 |
| Antimoniate, bbls ......lb. | .12 | .12½ | .12 | .15¼ | .13¾ | .16¼ |
| Arsenate, drs ..........lb. | .08 | .08½ | .08 | .08½ | .08 | .11½ |
| Arsenite, liq, drs ......gal. | .30 | .33 | .30 | .33 | .33 | .40 |
| Dry, gray, drs, wks ..lb. | .07½ | .09½ | .07½ | .09½ | ... | ... |
| Benzoate, USP, kgs ....lb. | .46 | .48 | .46 | .48 | .46 | .48 |
| Bicarb, powd, 400 lb bbl, wks ..............100 lb. | ... | 1.85 | ... | 1.85 | 1.75 | 1.85 |
| **Bichromate, 500 lb cks, wks* ..............lb.** | .06¾ | .07¼ | .06¾ | .07¼ | .06½ | .07¼ |
| Bisulfite, 500 lb bbl, wks lb. | .03¼ | .036 | .03¼ | .036 | .03¼ | .036 |
| 35-40% sol bbls, wks 100 lb. | 1.40 | 1.80 | 1.40 | 1.80 | ... | ... |
| Chlorate, bgs, wks ......lb. | .06¼ | .07½ | .06¼ | .07½ | .06¼ | .07½ |
| **Cyanide, 96-98%, 100 & 250 lb drs, wks ......lb.** | .14 | .15 | .14 | .17½ | .15½ | .17½ |
| Diacetate, 33-35% acid, bbls, lcl, delv ........lb. | ... | .09 | ... | .09 | ... | ... |
| Fluoride, white 90%, 300 lb bbls, wks ............lb. | .07½ | .08¼ | .07½ | .08¼ | .07½ | .08¼ |
| **Hydrosulfite, 200 lb bbls, f.o.b. wks ..........lb.** | .16 | .17 | .16 | .17 | .16 | .17 |
| **Hyposulfite, tech, pea crys 375 lb bbls, wks 100 lb.** | ... | 2.80 | 2.50 | 2.80 | 2.50 | 3.00 |
| **Tech, reg cryst, 375 lb bbls, wks ......100 lb.** | 2.45 | 2.80 | 2.40 | 2.80 | 2.40 | 2.75 |
| Iodide, jars ..........lb. | ... | 2.10 | 1.90 | 2.10 | 1.90 | 1.95 |
| Metal, drs, 280 lbs. ......lb. | ... | .19 | ... | .19 | ... | .19 |
| Metanilate, 150 lb bbls lb. | .41 | .42 | .41 | .42 | .41 | .42 |
| **Metasilicate, gran, c-l, wks ..........100 lb.** | ... | 2.20 | 2.15 | 2.20 | ... | 2.15 |
| cryst, drs, c-l, wks 100 lb. | ... | 2.90 | 2.75 | 2.90 | ... | 2.75 |
| Monohydrate, bbls ......lb. | ... | .023 | . | .023 | ... | .023 |
| Naphthenate, drs ......lb. | .12 | .19 | .12 | .19 | .09 | .19 |
| Naphthionate, 300 lb bbl lb. | .52 | .54 | .52 | .54 | .52 | .54 |

r Bone dry prices at Chicago 1c higher; Boston ½c; Pacific Coast 2c; **Philadelphia deliveries f.o.b. N. Y.; refined 6c higher in each case;** s T. N and Superfine prices quoted f.o.b. N. Y. and Boston; Chicago **prices 1c higher; Pacific Coast 3c; Philadelphia f.o.b. N. Y.** * Spot price is ⅛c higher; † Closing prices Aug. 27.

| | Current | Market | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Sodium (continued): | | | | | | |
| Nitrate, 92%, crude, 200 lb bgs, c-l, NY ........ton | ... | 28.30 | ... | 28.30 | 26.80 | 28.30 |
| 100 lb bgs ..........ton | ... | 29.00 | ... | 29.00 | 27.50 | 29.00 |
| Bulk ...............ton | ... | 27.00 | ... | 27.00 | 25.50 | 27.00 |
| Nitrite, 500 lb bbls .....lb. | .06¾ | .11½ | .06¾ | .11½ | .07 | .10 |
| Orthochlorotoluene, sulfonate, 175 lb bbls, wks ..lb. | .25 | .27 | .25 | .27 | .25 | .27 |
| Perborate, drs, 400 lbs ..lb. | .14¾ | .15¼ | .14¾ | .15¼ | .14¾ | .15¼ |
| Peroxide, bbls, 400 lb ...lb. | ... | .17 | ... | .17 | ... | .17 |
| Phosphate, di-sodium, tech, 310 lb bbls, wks 100 lb. | ... | 2.05 | ... | 2.05 | 1.90 | 2.05 |
| bgs, wks ..... 100 lb. | ... | 1.85 | ... | 1.85 | 1.70 | 1.85 |
| Tri-sodium, tech, 325 lb bbls, wks ........100 lb. | ... | 2.20 | ... | 2.20 | 2.05 | 2.20 |
| bgs, wks .........100 lb. | ... | 2.00 | ... | 2.00 | 1.85 | 2.00 |
| Picramate, 160 lb kgs ...lb. | .65 | .67 | .65 | .67 | .65 | .67 |
| Prussiate, Yellow, 350 lb bbl. wks ...........lb. | .09½ | .10 | .09 | .11½ | .10 | .11½ |
| Pyrophosphate, anhyd, 100 lb bbls fob wks frt eq lb. | ... | .0610 | .0610 | .10 | ... | .10 |
| Sesquisilicate, drs, c-l, wks ............100 lb. | ... | 2.80 | 2.80 | 3.00 | ... | ... |
| Silicate, 60°, 55 gal drs, wks ..........100 lb. | 1.65 | 1.70 | 1.65 | 1.70 | 1.65 | 1.70 |
| 40°, 55 gal drs, wks 100 lb. | ... | .80 | ... | .80 | ... | .80 |
| tks, wks .......100 lb. | ... | .65 | ... | .65 | ... | .65 |
| Silicofluoride, 450 lb bbls NY ...............lb. | .05¼ | .05½ | .05¼ | .06½ | .05¾ | .07 |
| Stannate, 100 lb drs ....lb. | .29 | .32 | .25½ | .32½ | .28 | .44 |
| Stearate, bbls ..........lb. | .19 | .24 | .19 | .24 | .19 | .24 |
| Sulfanilate, 400 lb bbls lb. | .16 | .18 | .16 | .18 | .16 | .18 |
| Sulfate Anhyd, 550 lb bgs* c-l, wks ...... 100 lb. † | 1.45 | 1.90 | 1.45 | 1.90 | 1.45 | 1.90 |
| Sulfide, 80% cryst, 440 lb bbls, wks .........lb. | ... | .02¼ | ... | .02¼ | ... | .02¼ |
| Solid, 650 lb drs, c-l, wks ..............lb. | ... | .03 | ... | .03 | ... | .02 |
| Sulfite, cryst, 400 lb bbls, wks ................lb. | .023 | .02½ | .023 | .02½ | .023 | .02½ |
| Sulfocyanide, drs .....lb. | .28 | .47 | .28 | .47 | .28 | .47 |
| Sulforicinoleate, bbls ...lb. | | .12 | | .12 | . | .12 |
| Tungstate, tech, crys, kgs lb. | 1.05 | 1.10 | 1.05 | 1.35 | .85 | .90 |
| Sorbitol, com, solut., wks, c-l drs, wks ..........lb. | ... | .17 | .17 | .19 | ... | .25 |
| Spruce Extract, ord, tks ..lb. | ... | .01⅛ | ... | .01⅛ | .01 | .01⅛ |
| Ordinary, bbls .......lb. | ... | .01⅝ | ... | .01⅝ | .01½ | .01⅝ |
| Super spruce ext, tks ...lb. | ... | .01⅜ | ... | .01⅜ | .01⅜ | .01⅝ |
| Super spruce ext, bbls ..lb. | ... | .01⅞ | ... | .01⅞ | ... | .01⅞ |
| Super spruce ext, powd, bgs ................lb. | ... | .04 | ... | .04 | .04 | .04¼ |
| Starch, Pearl, 140 lb bgs 100 lb. | 2.45 | 2.65 | 2.45 | 3.18 | 2.93 | 4.53 |
| Powd, 140 lb bgs ...100 lb. | 2.55 | 2.75 | 2.55 | 3.28 | 3.03 | 4.63 |
| Potato, 200 lb bgs ......lb. | .04 | .05 | .03½ | .05½ | .04½ | .05½ |
| Imp, bgs ..........lb. | .05 | .06 | .05 | .06 | .05 | .06 |
| Rice, 200 lb bbls .......lb. | .06¼ | .07¼ | .06¼ | .07¼ | . | .07¼ |
| Wheat, thick, bgs ......lb. | .06¼ | nom. | .06¼ | .07 | .07 | .08½ |
| Strontium carbonate, 600 lb bbls, wks ............lb. | .07¼ | .07½ | .07¼ | .07½ | .07¼ | .07½ |
| Nitrate, 600 lb bbls, NY lb. | .07¾ | .08¼ | .07¾ | .09¼ | .07¾ | .08¾ |
| Sucrose octa-acetate, den, grd, bbls, wks ..........lb. | ... | .45 | ... | .45 | ... | .45 |
| tech, bbls, wks .........lb. | ... | .40 | ... | .40 | ... | .40 |
| Sulfur, crude, f.o.b. mines ton | 18.00 | 19 00 | 18.00 | 19.00 | 18.00 | 19.00 |
| Flour, coml, bgs ....100 lb. | 1.65 | 2.35 | 1.65 | 2.35 | 1.65 | 2.35 |
| bbls ..............100 lb. | 1.95 | 2.70 | 1.95 | 2.70 | 1.95 | 2.70 |
| Rubbermakers, bgs..100 lb. | 2 20 | 2.80 | 2.20 | 2.80 | 2.20 | 2.80 |
| bbls ..............100 lb. | 2.55 | 3.15 | 2.55 | 3.15 | 2.55 | 3.15 |
| Extra fine, bgs .....100 lb. | 2.85 | 3.00 | 2.85 | 3.00 | 2.85 | 3.00 |
| Superfine, bgs ......100 lb. | 2.65 | 2.80 | 2.65 | 2.80 | 2.65 | 2.80 |
| bbls ..............100 lb. | 2.25 | 3.10 | 2.25 | 3.10 | 2.25 | 3.10 |
| Flowers, bgs .......100 lb. | 3 00 | 3.75 | 3.00 | 3.75 | 3.00 | 3.75 |
| bbls ..............100 lb. | 3.35 | 4.10 | 3.35 | 4.10 | 3.35 | 4.10 |
| Roll, bgs ...........100 lb. | 2.35 | 3.10 | 2.35 | 3.10 | 2.35 | 3.10 |
| bbls ..............100 lb. | 2.50 | 3.25 | 2.50 | 3.25 | 2.50 | 3.25 |
| Sulfur Chloride, 700 lb drs, wks ...............lb. | .03 | .04 | .03 | .04 | .02½ | .04 |
| Sulfur Dioxide, 150 lb cyl..lb. | .07 | .09 | .07 | .09 | .07 | .09 |
| Multiple units, wks .....lb. | .04½ | .07 | .04½ | .07 | .04½ | .07 |
| tks, wks ..............lb. | .04 | .05 | .04 | .05 | .04 | .05 |
| Refrigeration, cyl, wks..lb. | .16 | .17 | .16 | .17 | .15 | .17 |
| Multiple units, wks ....lb. | .07½ | .10 | .07½ | .10 | .07½ | .10 |
| Sulfuryl Chloride ........lb. | .15 | .40 | .15 | .40 | .15 | .40 |
| Sumac, Italian, grd ......ton | ... | 67.00 | 62.00 | 67.00 | 58.50 | 65 00 |
| Extract, 42°, bbls ......lb. | .05¼ | .06¼ | .05¼ | .06¼ | .05¼ | .06¼ |
| Superphosphate, 16% bulk, wks ................ton | ... | 8.00 | 8.00 | 9.00 | 8.25 | 9.00 |
| Run of pile ...........ton | ... | 7.50 | 7.50 | 8.50 | 8.00 | 8.50 |
| Triple, 40-48%, a.p.a. bulk, wks, Balt. unit ......ton | ... | .70 | .70 | .85 | .70 | .85 |
| Talc, Crude, 100 lb bgs, NY ton | 13.00 | 15.00 | 13.00 | 15.00 | 13.00 | 15.00 |
| Ref'd, 100 lb bgs, NY ton | 14.00 | 16.00 | 14.00 | 16.00 | 14.00 | 16.00 |
| French, 220 lb bgs, NY ton | 23.00 | 30.00 | 23.00 | 30.00 | 23.00 | 30.00 |
| Ref'd, white, bgs, NY ton | 45.00 | 60 00 | 45.00 | 60.00 | 45.00 | 60.00 |
| Italian, 220 lb bgs to arr ton | 60.00 | 62.00 | 60.00 | 62.00 | 60.00 | 62.00 |
| Ref'd, white, bgs, NY ton | 65.00 | 70.00 | 65.00 | 70.00 | 65.00 | 70.00 |
| Tankage Grd, NY .....unit ‡ | ... | 2.70 | 2.50 | 3.00 | 3.00 | 4.40 |
| Ungrd ...........unit ‡ | ... | 2.70 | 2.35 | 3.00 | 2.80 | 4.35 |
| Fert grade, f.o.b. Chgo unit ‡ | ... | 2.55 | 2.25 | 2.65 | 2.75 | 4.00 |
| South American cif unit ‡ | ... | 3.25 | 3.00 | 3.45 | 3.15 | 4.25 |
| Tapioca Flour, high grade, bgs ..................lb. | .02 | .05½ | .02 | .05½ | .03¼ | .05½ |
| Tar Acid Oil, 15%, drs ..gal. | .22 | .25 | .22 | .25½ | .21 | .25½ |
| 25%, drs .............gal. | .25½ | .28½ | .25½ | .29½ | .24½ | .29½ |
| Tar, pine, delv, drs .....gal. | ... | .26 | ... | .26 | ... | .26 |
| tks, delv, E. cities .....gal. | ... | .20 | ... | .20 | ... | .20 |
| Tartar Emetic, tech, bbls..lb. | .27¾ | .28 | .26¾ | .28 | .24¾ | .27 |
| USP, bbls ............lb. | .33 | .33½ | .32 | .33½ | .30 | .32½ |

† Bags 15c lower; ‡ + 10; *Bbls. are 20c higher.

# *Current*

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Terpineol, den grade, drs lb. | ... | .17 | ... | .17 | .13¾ | .14¾ |
| Tetrachlorethane, 650 lb drs lb. | .08 | .08½ | .08 | .08½ | .08 | .08½ |
| **Tetrachloroethylene, drs,** tech lb. | ... | .09½ | ... | .09½ | ... | .10½ |
| Tetralene, 50 gal drs, wks lb. | .12 | .13 | .12 | .13 | .12 | .13 |
| Thiocarbanilid, 170 lb bbls lb. | .20 | .25 | .20 | .25 | .20 | .25 |
| Tin, crystals, 500 lb bbls, wks lb. | .34½ | .35 | .31 | .35½ | .33 | .46 |
| Metal, NY lb. | ... | .43 | .3570 | .44¼ | .41 | .66 |
| Oxide, 300 lb bbls, wks lb. | .48 | .50 | .44 | .50 | .48 | .62 |
| **Tetrachloride, 100 lb drs,** wks lb. | ... | .22 | .18½ | .22½ | .21 | .32 |
| Titanium Dioxide, 300 lb bbls lb. | .15¼ | .16 | .15¼ | .17 | .16¼ | .17 |
| Barium Pigment, bbls lb. | .05⅝ | .05⅞ | .05⅝ | .06⅜ | .06 | .06⅜ |
| Calcium Pigment, bbls lb. | .05⅝ | .05⅞ | .05⅝ | .06⅜ | .06 | .06⅜ |
| **Toluidine, mixed, 900 lb drs,** wks lb. | .26 | .27 | .26 | .27 | .26 | .27 |
| Toluol, 110 gal drs, wks gal. | ... | .27 | .27 | .35 | ... | .35 |
| 8000 gal tks, frt all'd gal. | ... | .22 | .22 | .30 | ... | .30 |
| Toner Lithol, red, bbls lb. | .75 | .80 | .75 | .80 | .75 | .80 |
| Para, red, bbls lb. | .75 | .80 | .75 | .80 | ... | .75 |
| Toluidine, bgs lb. | .. | 1.35 | ... | 1.35 | ... | 1.35 |
| Triacetin, 50 gal drs, wks lb. | ... | .36 | ... | .36 | ... | .36 |
| Triamyl Borate, lcl, drs, wks lb. | ... | .27 | ... | .27 | ... | .27 |
| Triamylamine, c-l, drs, wks lb. | .77 | 1.25 | .77 | 1.25 | .77 | 1.25 |
| Tributylamine, lcl, drs, wks lb. | ... | .70 | ... | .70 | ... | ... |
| Tributyl citrate, drs, frt all'd lb. | ... | .45 | ... | .45 | ... | .45 |
| Tributyl Phosphate, frt all'd lb. | ... | .50 | ... | .50 | ... | .50 |
| **Trichlorethylene, 600 lb drs,** frt all'd E. Rocky Mts lb. | .089 | .094 | .089 | .094 | .089 | .094 |
| Tricresyl phosphate, tech, drs lb. | .24½ | .39 | .24½ | .39 | .22½ | .26½ |
| **Triethanolamine, 50 gal drs** wks lb. | .21 | .22 | .21 | .22 | .21 | .30 |
| tks, wks lb. | ... | .20 | ... | .20 | .20 | .25 |
| Triethylene glycol, drs, wks lb. | ... | .26 | ... | .26 | ... | ... |
| **Trihydroxyethylamine Oleate,** bbls lb. | ... | .30 | ... | .30 | ... | ... |
| Stearate, bbls lb. | ... | .30 | ... | .30 | ... | ... |
| Trimethyl Phosphate, drs, lcl fob dest lb. | ... | .50 | ... | .50 | ... | ... |
| Trimethylamine, c-l, drs, frt all'd E. Mississippi lb. | ... | 1.00 | ... | 1.00 | ... | 1.00 |
| Triphenylguanidine lb. | .58 | .60 | .58 | .60 | .58 | .60 |
| Triphenyl Phosphate, drs lb. | ... | .38 | .34 | .38 | ... | ... |
| Tripoli, airfloated, bgs, wks ton | 26.00 | 30.00 | 26.00 | 30.00 | 25.00 | 30.00 |
| **Turpentine (Spirits), c-l, NY** dock, bbls gal. | ... | .28 | .27½ | .31½ | .31 | .47 |
| Savannah, bbls gal. | ... | .22¼ | .22¼ | .30¾ | .25 | .42 |
| Jacksonville, bbls gal. | ... | .22 | .22 | .30¾ | .25 | .41 |
| **Wood Steam dist, bbls, c-l,** NY gal. | ... | .27 | .27 | .31 | .30 | .44 |
| Wood, dest dist, c-l, drs, delv E. cities gal. | ... | .36 | .33 | .36 | ... | ... |
| Urea, pure, 112 lb cases lb. | .14½ | .15½ | .14½ | .15½ | .14½ | .15½ |
| Fert grade, bgs, c.i.f. ton | ... | ... | ... | ... | ... | ... |
| c.i.f. S.A. points ton | 95.00 | 110.00 | 95.00 | 110.00 | 95.00 | 110.00 |
| Dom, f.o.b., wks ton | 95.00 | 101.00 | 95.00 | 101.00 | 95.00 | 101.00 |
| **Urea Ammonia liq 55% $NH_3$,** tks unit | ... | 1.00 | 1.00 | 1.04 | 1.00 | 1.04 |
| **Valonia beard, 42%, tannin** bgs ton | ... | 45.00 | 45.00 | 52.00 | 35.00 | 52.00 |
| Cups, 32% tannin, bgs ton | 32.00 | 34.00 | 33.00 | 37.50 | 31.50 | 36.00 |
| Extract, powd, 63% lb. | ... | .06 | ... | .06 | ... | ... |
| **Vanillin, ex eugenol, 25 lb** tins, 2000 lb lots lb. | ... | 2.10 | 2.10 | 3.10 | 3.10 | 3.65 |
| Ex-guaiacol lb. | ... | 2.00 | 2.00 | 3.00 | 3.00 | 3.55 |
| Ex-lignin lb. | ... | 2.00 | 2.00 | 2.25 | ... | ... |
| Vermilion, English, kgs lb. | 1.55 | 1.69 | 1.45 | 1.69 | 1.60 | 1.90 |
| Wattle Bark, bgs ton | 39.75 | 41.75 | 39.75 | 41.75 | 31.00 | 43.75 |
| Extract, 60°, tks, bbls lb. | ... | .04⅜ | .04⅜ | .04⅝ | .03⅝ | .04⅝ |

## WAXES

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Wax, Bayberry, bgs lb. | .16¾ | .17 | .16¾ | .17 | .16½ | .17½ |
| **Bees, bleached, white 500** lb slabs, cases lb. | .37 | .39 | .35 | .45 | .38 | .45 |
| Yellow, African, bgs lb. | .21 | .21½ | .21 | .26 | .25 | .30 |
| Brazilian, bgs lb. | .22 | .23 | .22 | .29 | .27 | .34 |
| Chilean, bgs lb. | .22 | .23 | .22 | .29 | .27 | .34 |
| Refined, 500 lb slabs, cases lb. | .32½ | .33 | .32 | .39 | .29½ | .39 |
| Candelilla, bgs lb. | .14½ | .15½ | .13½ | .15½ | .13 | .16½ |
| **Carnauba, No. 1, yellow,** bgs lb. | .42½ | .44 | .38 | .44 | .42 | .49 |
| No. 2, yellow, bgs lb. | .41½ | .42 | .36 | .42 | .41 | .46½ |
| No. 2, N. C., bgs lb. | .37 | .37½ | .35½ | .40 | .38 | .43 |
| No. 3, Chalky, bgs lb. | .33½ | .35½ | .31½ | .35½ | .33 | .40 |
| No. 3, N. C., bgs lb. | .33½ | .35½ | .31½ | .35½ | .34 | .43 |
| Ceresin, dom, bgs lb. | .08½ | .11½ | .08½ | .11½ | .08 | .12 |
| Japan, 224 lb cases lb. | .10 | .09½ | .09¼ | .10½ | .09½ | .11¼ |
| Montan, crude, bgs lb. | .11 | .12 | .11 | .12 | .11 | .12 |
| **Paraffin, see Paraffin Wax.** | | | | | | |
| Spermaceti, blocks, cases lb. | .23 | .24 | .23 | .24 | .23 | .24 |
| Cakes, cases lb. | .24 | .25 | .24 | .25 | .24 | .25 |
| **Whiting, chalk, com, 200 lb bgs** c-l, wks ton | 12.00 | 14.00 | 12.00 | 14.00 | 12.00 | 14.00 |
| Gilders, bgs, c-l, wks ton | ... | 15.00 | ... | 15.00 | ... | 15.00 |
| Wood Flour, c-l, bgs ton | 20.00 | 33.00 | 20.00 | 33.00 | 18.00 | 30.00 |
| **Xylol, frt allowed, East 10°** tks, wks gal. | ... | .29 | .29 | .33 | ... | .33 |
| Coml, tks, wks, frt all'd gal. | ... | .26 | .26 | .30 | ... | .30 |
| Xylidine, mixed crude, drs lb. | .35 | .36 | .35 | .36 | .35 | .36 |
| Zinc Acetate, tech, bbls, lcl, delv lb. | ... | .21 | .. | .21 | ... | ... |
| Arsenate, bgs, frt all'd lb. | .12½ | .13 | .12½ | .13½ | ... | ... |
| Arsenite, bgs, frt all'd lb. | .12½ | .13 | .12½ | .13 | ... | ... |
| Carbonate tech, bbls, NY lb. | .14 | .15 | .14 | .15 | .12 | .15 |
| **Chloride fused, 600 lb drs,** wks lb. | .04½ | .046 | .04½ | .046 | .04½ | .046 |
| Gran, 500 lb drs, wks lb. | .05 | .05¼ | .05 | .05¼ | .05 | .05¼ |
| Soln 50%, tks, wks 100 lb. | ... | 2.25 | .. | 2.25 | 2.00 | 2.25 |
| Cyanide, 100 lb drs lb. | ... | .33 | .33 | .38 | .36 | .38 |
| Dust, 500 lb bbls, c-l, delv lb. | ... | .06¾ | .06 | .0740 | .0740 | .094 |

# *Prices—Current*



| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Zinc (continued): | | | | | | |
| Metal, high grade slabs, c-l, | | | | | | |
| NY ........ 100 lb. | ... | 5.15 | 4.35 | 5.35 | 5.35 | 7.85 |
| E. St. Louis .100 lb. | ... | 4.75 | 4.00 | 5.00 | 5.00 | 7.50 |
| Oxide, Amer, bgs, wks lb. | .06¼ | .07½ | .06 | .07½ | .05¼ | .07¾ |
| French 300 lb bbls, wks lb. | .06¼ | .07¾ | .06¼ | .07¾ | .05½ | .07¾ |
| Palmitate, bbls ..... lb. | .23 | .25 | .23 | .25 | .23 | .25 |
| Resinate, fused, pale, bbls lb. | ... | .10 | ... | .10 | .09 | .10 |
| Stearate, 50 lb bbls lb. | .20 | .23 | .20 | .23 | .20 | .23 |
| Zinc Sulfate, crys, 400 lb bbl, | | | | | | |
| wks ........ lb. | ... | .029 | .029 | .033 | .028 | .033 |
| Flake, bbls ..... lb. | ... | .0325 | .0325 | .0375 | .032 | .0375 |
| Sulfide, 500 lb bbls, delv lb. | .08⅝ | .08⅞ | .08⅝ | .09¾ | .09¼ | .09¾ |
| bgs, delv ........ lb. | .08⅜ | .08⅝ | .08⅜ | .09 | .09 | .09½ |
| Sulfocarbolate, 100 lb kgs | | | | | | |
| ........ lb. | .24 | .26 | .24 | .26 | .24 | .26 |
| Zirconium Oxide, crude, 73-75% | | | | | | |
| grd, bbls, wks ...... ton | 75.00 | 100.00 | 75.00 | 100.00 | ... | ... |
| kgs, wks ........ lb. | .04¼ | .04½ | .04¼ | .04½ | ... | ... |

## *Oils and Fats*

| | Current Market | | 1938 Low | 1938 High | 1937 Low | 1937 High |
|---|---|---|---|---|---|---|
| Babassu, tks, futures ..... lb. | ... | .06⅜ | .06¼ | .06¾ | .06¾ | .11¼ |
| Castor, No. 3, 400 lb bbls lb. | .09¼ | .10 | .09¼ | .10¾ | .10¼ | .10¾ |
| Blown, 400 lb bbls lb. | .11¼ | .12 | .11¼ | .13 | .12¼ | .13 |
| China Wood, drs, spot NY lb. | .13½ | .13¾ | .10¼ | .15¼ | .12½ | .23 |
| Tks, spot NY ..... lb. | .128 | .13 | .095 | .15½ | .118 | .23 |
| Coconut, edible, bbls NY lb. | ... | .09 | .09 | .09½ | .09½ | .15 |
| Manila, tks, NY ....... lb. | ... | .03¼ | .03¼ | .04¼ | .04 | .09½ |
| Tks, Pacific Coast lb. | ... | .02⅞ | .02⅞ | .03¾ | .03¾ | .08⅞ |
| Cod, Newfoundland, 50 gal | | | | | | |
| bbls ........ gal. | .38 | nom. | .38 | .52 | .51 | .52 |
| Copra, bgs, NY ........ lb. | | .0185 | .0185 | .0235 | .0235 | .055 |
| Corn, crude, tks, mills .... lb. | .08 | .08¼ | .06⅝ | .08¼ | .06½ | .10¾ |
| Refd, 375 lb bbls, NY .. lb. | .10¼ | .10½ | .09¼ | .10½ | .09 | .13¼ |
| Degras, American, 50 gal bbls. | | | | | | |
| NY ........ lb. | 07¾ | .08¼ | .07½ | .08¼ | .07½ | .08¼ |
| English, bbls, NY ..... lb. | .07¾ | .08¼ | .07½ | .08¼ | .07½ | .08¼ |
| Greases, Yellow ........ lb. | .04¾ | .05 | .03½ | .05½ | .04½ | .09 |
| White, choice bbls, NY lb. | .05⅝ | .06 | .05 | .07 | .06¾ | .10¼ |
| Lard Oil, edible, prime .... lb. | ... | .11½ | .11⅛ | .12¾ | .12¾ | .16¾ |
| Extra, bbls ........ lb. | ... | .09 | .09 | .10¾ | .10¾ | .13½ |
| Extra, No. 1, bbls ..... lb. | ... | .08¾ | .08¾ | .09¼ | .09¼ | .13½ |
| Linseed, Raw less than 5 bbl | | | | | | |
| lots ........ lb. | .089 | .092 | .089 | .115 | .107 | .121 |
| bbls, c-l, spot ....... lb. | .081 | .084 | .081 | .102 | .099 | .113 |
| Tks ........ lb. | .07½ | .078 | .07½ | .096 | .093 | .107 |
| Menhaden, tks, Baltimore gal. | .30 | nom. | .34½ | .37½ | .34 | .45 |
| Refined, alkali, drs ..... lb. | .07½ | .077 | .07½ | .095 | .08 | .10 |
| Tks ........ lb. | ... | .069 | .069 | .087 | .074 | .09 |
| Kettle bodied, drs ..... lb. | .084 | .086 | .084 | .105 | .09 | .11 |
| Light pressed, drs ..... lb. | .069 | .0710 | .069 | .091 | .074 | .094 |
| Tks ........ lb. | ... | .063 | .063 | .08 | .067 | .084 |
| Neatsfoot, CT, 20°, bbls, NY | | | | | | |
| ........ lb. | ... | .15¼ | .15¼ | .17¼ | .16¾ | .18¼ |
| Extra, bbls, NY ....... lb. | ... | .09¼ | .09⅛ | .10 | .09½ | .13¾ |
| Pure, bbls, NY ....... lb. | ... | .11¾ | .11¾ | .12¼ | .11¾ | .14¼ |
| Oiticica, bbls ........ lb. | .10¾ | .11 | .09¼ | .12¾ | .10⅞ | .17 |
| Oleo, No. 1, bbls, NY .... lb. | ... | .09¾ | .08½ | .10½ | .10½ | .14½ |
| No. 2, bbls, NY ..... lb. | ... | .09¼ | .08 | .10 | .10 | .14 |
| Olive, denat, bbls, NY ... gal. | .94 | .98 | .88 | 1.20 | 1.15 | 1.65 |
| Edible, bbls, NY ..... gal. | 1.75 | 2.00 | 1.75 | 2.35 | 2.20 | 2.50 |
| Foots, bbls, NY ....... lb. | .07⅜ | .07¼ | .07⅞ | .09⅞ | .09⅝ | .12½ |
| Palm, Kernel, bulk ...... lb. | ... | .0365 | .0365 | .04½ | .04½ | .08⅛ |
| Niger, cks ........ lb. | .036 | .037 | .032 | .04½ | .04 | .07¼ |
| Sumatra, tks ........ lb. | ... | .03 | .03 | .0375 | .0375 | .06½ |
| Peanut, crude, bbls, NY .. lb. | ... | .07½ | .07 | .08¼ | .06¼ | .10⅝ |
| Tks, f.o.b. mill ....... lb. | ... | .07¼ | .06⅝ | .08 | .06½ | .10¼ |
| Refined, bbls, NY ..... lb. | .10½ | .10¾ | .09¾ | .10¾ | .10 | .13½ |
| Perilla, drs, NY ....... lb. | .10½ | .10¾ | .10 | .11¾ | .11 | .13½ |
| Tks, Coast ........ lb. | .098 | .10 | .096 | .11 | .105 | .13 |
| Pine, see Pine Oil, Chemical Section. | | | | | | |
| Rapeseed, blown, bbls, NY lb. | .14 | .14½ | .14 | .14¾ | .13 | .14¾ |
| Denatured, drs, NY ... gal. | .75 | .80 | .75 | .91 | .85 | .97 |
| Red, Distilled, bbls ...... lb. | ... | .08⅜ | .08⅜ | .10⅝ | .09⅝ | .12⅝ |
| Tks ........ lb. | . | .07½ | .07½ | .09¾ | .08¾ | .10¾ |
| Sardine, Pac Coast, tks .. gal. | .28½ | nom. | .28½ | .46½ | .35 | .55 |
| Refined alkali, drs ..... lb. | .07½ | .077 | .07½ | .095 | .08 | .10 |
| Tks ........ lb. | ... | .069 | .069 | .087 | .074 | .09 |
| Light pressed, drs ..... lb. | .069 | .077 | .069 | .089 | .074 | .094 |
| Tks ........ lb. | ... | .063 | .063 | .08 | .067 | .084 |
| Sesame, yellow, dom ..... lb. | ... | .10½ | .10¼ | .10½ | .10¼ | .13¼ |
| White, dom ........ lb. | ... | .10½ | .10¼ | .10½ | .10¼ | .13¼ |
| Soy Bean, crude | | | | | | |
| Dom, tks, f.o.b. mills ... lb. | ... | .05⅞ | .05⅞ | .07 | .06 | .10½ |
| Crude, drs, NY ..... lb. | .06½ | .07 | .06½ | .08 | .066 | .11½ |
| Ref'd, drs, NY ..... lb. | .06⅝ | .07 | .07⅝ | .097 | .078 | .12½ |
| Tks lb. | ... | .0685 | .0685 | .082 | .072 | .11½ |
| Sperm, 38° CT, bleached, bbls | | | | | | |
| NY lb. | .10 | .102 | .10 | .102 | .096 | .102 |
| 45° CT, bleached, bbls, | | | | | | |
| NY lb. | .093 | .095 | .093 | .095 | .089 | .095 |
| Stearic Acid, double pressed | | | | | | |
| dist bgs lb. | .11 | .12 | .11 | .12 | .11 | .13½ |
| Double pressed saponified | | | | | | |
| bgs lb. | .11¼ | .12¼ | .11¼ | .12¼ | .11¼ | .13¾ |
| Triple pressed dist bgs lb. | .14 | .15 | .14 | .15 | .14 | .16½ |
| Stearine, Oleo, bbls lb. | .07¾ | .08 | .05½ | .08½ | .07 | .11½ |
| Tallow City, extra loose ... lb. | | .05¼ | .04¾ | .06⅜ | .05⅞ | .09¼ |
| Edible, tierces lb. | .07⅜ | .07⅝ | .06 | .07⅝ | .06⅞ | .10¼ |
| Acidless, tks, NY lb. | . | .08 | .08 | .09¼ | .09 | .13 |
| Turkey Red, single, bbls lb. | .06¼ | .08½ | .06¼ | .08½ | .08 | .08½ |
| Double, bbls lb. | .09½ | .11 | .09½ | .13 | .12½ | .13 |
| Whale: | | | | | | |
| Winter bleach, bbl, NY lb. | .081 | .083 | .081 | .10 | .091 | .111 |
| Refined, nat. bbls, NY ... lb | .077 | .079 | .077 | .096 | .087 | .107 |

# *Index to Advertisers*

# "We"—Editorially Speaking

Of all the saga of Egan which has been retold at the Chemists' Club during the past month, no story seems so typical of that well trained and faithful club servant as that of the member who came in late one Sunday evening and ordered a "double Johnnie Walker—black-labeled—with a pint of Appolinaris." Rather tardily, Egan appeared at his door with a bottle of 'red label' and a split of club soda. The bar was closed and Egan could not find the right bottles, but his explanation was Chesterfieldian: "I've brought you red label, Mr. Jones—the black label's not worth the difference, and as for the Appolinaris—well, sir, in such times one really should be a bit careful how one throws money about."

An esteemed correspondent refers to this as "your 'Wee' page" and in the language of the print shop We cry, "Let it stand."

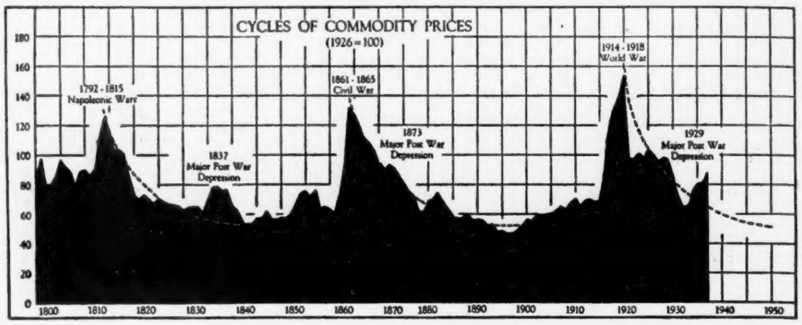
Only upon the supposition that "there is a new one born every minute" do We warn our readers against the "surveys" offered for sale at reasonably stiff prices by a group designating themselves "J. J. Berliner & Associates."

Although we have in writing refused them permission and indeed warned them not to reprint material from Chemical Industries without our definite knowledge and specific consent, they are selling for $5.85 per copy the article on "Industrial Aspects of Baking Powder," by Simon Mendelsohn, copied almost word for word from our June issue without acknowledgement to the source or the author.

Will any of our readers who have any similar instances of the misuse of copyrighted material from our pages be good enough to cooperate with us to stop this very nasty form of brain thievery by reporting the facts to us in full detail.

Thanks.

The 30 Year Decline in Prices after Major Wars





Source: Bureau of Labor Statistics, U. S. Dept. of Labor.

What a sad pity that the organization of four regional laboratories by the Department of Agriculture to study industrial uses of farm materials has come through only after the deaths of Francis Garvan and Charles Herty. These two good Jeffersonian Democrats pleaded and argued for five years with the New Dealers to put some of their lavish expenditures into research of this sort. Secretary Wallace in person replied that the chemurgic movement was "old stuff" and that the Federal Government for more than twenty years had been working hard on the industrial utilization of farm wastes.

Quite so—though not quite the same thing as the deliberate cultivation of crops for the industries; nevertheless.

If so, what a sorry record! For during the past twenty years We have noted the development of the following important triumphs in these fields: rayon, cellulose plastics, furfural, wallboard from bagasse. There are none others of real industrial importance and all of these four are the children of private, not public, research.

Fertilizer consumption figures by states contain some surprises. At the head of the list stands Florida with 119 pounds per acre. New Jersey is second with 80 pounds; Rhode Island third with 56 pounds; followed by North Carolina, 52 pounds; Maine, 48 pounds; Connecticut, 45 pounds; South Carolina, 44 pounds. At the foot are Colorado, 0.10 pounds; North Dakota, 0.001 pounds; Nebraska, 0.0041 pounds; and South Dakota, 0.0039 pounds per acre.

The news story of Mr. Willard Dow's $15,000 ethyl cellulose suit is "tops" in chemical publicity for the summer season. Clothes from spruce trees make almost as good a newspaper yarn as gold from sea water.

### *Fifteen Years Ago*

*From our issues of September, 1923*

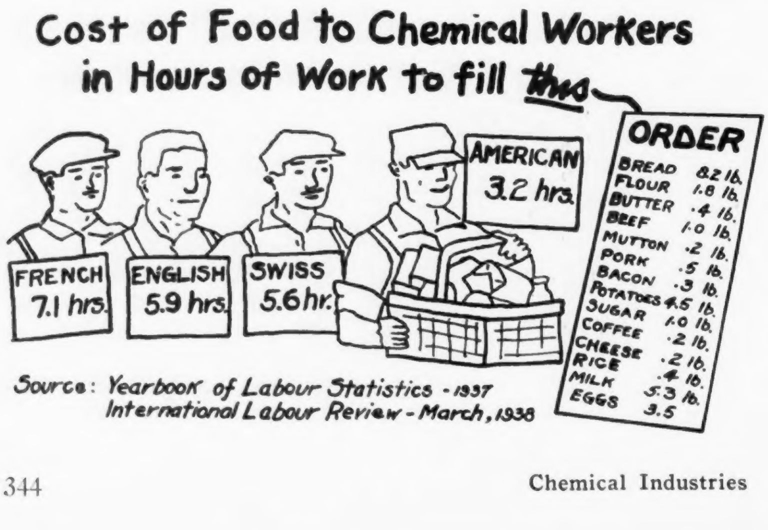
**Dr. Ira Remsen awarded Priestley Medal of the A. C. S. for distinguished services to chemistry.**

**Ralph Dorland elected president Chemical Salesmen's Association.**

**Publicker Commercial Alcohol Co., Phila., forms new company in New York.**

**Superfos Co., New York, becomes associated with Philipp Bauer & Co., Hamburg, as American representative.**

**Allied Chemical & Dye donates gift of $500,000 to A. C. S. to found American Chemical Prize, annual value $25,000, to be awarded chemist making outstanding contribution in science of chemistry.**



CH

VOL. 43
Sept. '38

# CHEMICAL INDUSTRIES

*Statistical and Technical Data Section*

NO. 3
Part 2



## State of Chemical Trade

Current Statistics (August 31, 1938)—p. 17

### WEEKLY STATISTICS OF BUSINESS

| Week Ending | Carloadings 1938 | Carloadings 1937 | Carloadings % of Change | Electrical Output* 1938 | Electrical Output* 1937 | Electrical Output* % of Change | Jour. of Com. Price Index | Nat'l Fertilizer Ass'n Price Indices: Chem. & Drugs | Fats & Oils | Fert. Mat. | Mixed Fert. | All Groups | †Labor Dept. Chem. & Drug Price Index | % Steel Activity | N. Y. Times Index Bus. Act. | Fisher's Index Pur. Power |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 23..... | 580,882 | 767,470 | —24.3 | 2,084,763 | 2,258,776 | — 7.7 | 76.6 | 94.2 | 63.3 | 69.8 | 77.1 | 74.6 | 77.0 | 37.0 | 80.8 | 122.7 |
| July 30..... | 588,703 | 779,091 | —24.4 | 2,093,907 | 2,256,335 | — 7.2 | 77.6 | 94.2 | 62.8 | 69.8 | 77.1 | 74.7 | 77.0 | 39.8 | 81.7 | 122.7 |
| Aug. 6..... | 584,050 | 766,182 | —23.8 | 2,115,847 | 2,261,725 | — 6.4 | 75.8 | 94.2 | 61.9 | 70.0 | 77.1 | 74.0 | 77.4 | 39.4 | 83.1 | 122.9 |
| Aug. 13..... | 589,561 | 773,783 | —23.8 | 2,133,641 | 2,300,547 | — 7.3 | 74.7 | 94.2 | 59.3 | 69.9 | 77.1 | 73.1 | 77.2 | 40.4 | 83.9 | 123.1 |
| Aug. 20..... | 597,918 | 777,145 | —23.1 | 2,138,517 | 2,304,032 | — 7.2 | 75.2 | 94.2 | 59.3 | 69.7 | 78.0 | 72.9 | 77.1 | 42.8 | 84.4 | 122.9 |
| Aug. 27..... | ...... | ...... | ...... | 2,134,057 | 2,294,713 | — 7.0 | .... | 94.2 | 58.4 | 69.5 | 78.0 | 73.1 | .... | .... | .... | .... |

* K.W.H., 000 omitted; † 1926-1928 = 100.0.

### MONTHLY STATISTICS

| CHEMICAL: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| ***Acid, sulfuric* (expressed as 50° Baumé, short tons, Bureau of the Census)** | | | | | | |
| Total prod. by fert. mfrs. .... | ........ | 166.927 | 114.199 | 154.275 | 137.764 | 176.703 |
| Consumpt. in mfr. fert. ...... | ........ | 140.230 | 102.228 | 121.716 | 119.218 | 146.301 |
| Stocks end of month ......... | ........ | 75,583 | 83,289 | 76,052 | 87,129 | 67,475 |
| *Alcohol, Industrial* (Bureau Internal Revenue) | | | | | | |
| Ethyl alcohol prod., proof. gal. | 16,370,040 | 18.253,750 | 16,395,184 | 18,657,582 | 14,226.450 | 16,938.983 |
| Comp. denat. prod., wine gal. | 1,303,324 | 1,027,067 | 2,492,965 | 878.226 | 899,696 | 921,937 |
| Removed, wine gal. ......... | 1,268,542 | 926.013 | 2,437.777 | 814.063 | 823,778 | 919.461 |
| Stocks end of mo., wine gal... | 732,896 | 957,886 | 699.771 | 857,663 | 641.284 | 794.475 |
| Spec. denat. prod., wine gal. .. | 5,407,884 | 5,725,806 | 5.376,687 | 7,441,693 | 5,190,640 | 6.515,668 |
| Removed, wine gal. ........ | 5,456,310 | 5,657,649 | 5,374.813 | 7,419,345 | 5.268,695 | 6 591.728 |
| Stocks end of mo., wine gal... | 437,548 | 864,396 | 491,850 | 799,468 | 495,937 | 783,906 |
| Ammonia sulfate prod., tons *a* | ........ | ........ | 27,967 | 64.093 | 32,000 | 71,903 |
| Benzol prod., gals. *b* .......... | ........ | ........ | 4,413,000 | 9,517,000 | 4,905,000 | 10.448,000 |
| Byproducts coke, prod., tons *a* | ........ | ........ | 2,066,530 | 4,024,259 | 2,282,621 | 4,478,667 |
| *Cellulose Plastic Products* (Bureau of the Census) | | | | | | |
| Nitrocellulose sheets, prod., lbs. | ........ | 1,019,657 | 429,439 | 1,164.875 | 415.981 | 1.237.034 |
| Sheets, ship., lbs. .......... | ........ | 992,918 | 542.265 | 1.234.223 | 503.539 | 1.072.196 |
| Rods, prod., lbs. ............ | ........ | 193,791 | 145,197 | 292,784 | 212.167 | 297.904 |
| Rods, ship., lbs. ............ | ........ | 330,996 | 130,974 | 294.391 | 192.875 | 315.409 |
| Tubes, prod., lbs. .......... | ........ | 67,607 | 37,011 | 78.549 | 40.096 | 91.860 |
| Tubes, ship., lbs. ........... | ........ | 72,425 | 48,814 | 71,112 | 58,610 | 62,086 |
| Cellulose acetate, sheets, rods, tubes | | | | | | |
| Production, lbs. ............ | ........ | 830.922 | 288,385 | 1.112,603 | 257.722 | 1.170.106 |
| Shipments, lbs. .............. | ........ | 887,938 | 323,356 | 1,042.937 | 253,491 | 1.098,812 |
| *Methanol* (Bureau of the Census) | | | | | | |
| Production, crude, gals. ....... | ........ | 465.205 | 293.091 | 485.943 | 330.875 | 522 961 |
| Production, synthetic, gals. .... | ........ | 2.564,783 | 1.629,570 | 2.263.507 | 1,860.400 | 2.353.497 |
| *Pyroxylin-Coated Textiles* (Bureau of the Census) | | | | | | |
| Light goods, ship., linear yds. | ........ | 2.631.155 | 2.144.974 | 3.146.915 | 2.558 834 | 3.664.620 |
| Heavy goods, ship., linear yds. | ........ | 1.489.980 | 1.289.869 | 1.870.658 | 1.513.237 | 2.062.580 |
| Pyroxylin spreads, lbs. *c* .... | ........ | 4.316.537 | 3.335,209 | 4.957,803 | 4,149,846 | 5,555,434 |
| *Exports* (Bureau of Foreign & Dom. Commerce) | | | | | | |
| Chemicals and related prod. *d* | $9.700 | $12.300 | ........ | ........ | $10.668 | ........ |
| Crude sulfur *d*................ | $513 | $1,192 | $1.048 | $1.002 | $956 | $1.229 |
| Coal-tar chemicals *d*.......... | $624 | $1,146 | $821 | $1.336 | $980 | $1.748 |
| Industrial chemicals *d*.......... | $2.079 | $2,459 | $1,992 | $2.449 | $2.088 | $2,946 |
| *Imports* | | | | | | |
| Chemicals and related prod. *d*.. | $4,800 | $6,700 | ........ | ........ | $6,533 | ........ |
| Coal-tar chemicals *d*.......... | $1,555 | $1.649 | $887 | $1.876 | $1,579 | $1,000 |
| Industrial chemicals *d*........ | $1,378 | $2,246 | $1,434 | $2.561 | $1,188 | $2,632 |
| ***Payrolls* (U. S. Dept. of Labor, 3 year av., 1923-25 = 100)** | | | | | | |
| Chemicals and allied prod., including petroleum ............ | 114.2 | 136.8 | 114.8 | 173.4 | 117.7 | 136.7 |
| Other than petroleum ......... | 107.7 | 134.9 | 108.0 | 135.7 | 111.3 | 136.2 |
| Chemicals .................. | 116.3 | 153.9 | 117.2 | 153.5 | 115.9 | 152.5 |
| Explosives .................. | 92.4 | 103.8 | 89.3 | 103.0 | 85.9 | 103.2 |
| ***Employment* (U. S. Dept. of Labor, 3 year av., 1923-25 = 100)** | | | | | | |
| Chemicals and allied prod., including petroleum .......... | 104.1 | 124.3 | 103.9 | 123.9 | 107.2 | 124.5 |
| Other than petroleum ........ | 100.6 | 123.5 | 100.6 | 123.4 | 104.8 | 124.6 |
| Chemicals .................. | 107.7 | 139.5 | 107.7 | 138.5 | 107.6 | 137.5 |
| Explosives .................. | 85.2 | 95.3 | 84.9 | 94.8 | 84.8 | 90.7 |
| Stocks of chemicals, etc.** | | | | | | |
| Finished ..................... | ........ | 141 | ........ | 141 | 177 | 144 |
| Raw material ............... | ........ | 73 | ........ | 74 | 87 | 75 |
| Price index chemicals ........ | 81.7 | 89.9 | 80.6 | 90.1 | 81.2 | 91.1 |
| Chem. and drugs .......... | 74.8 | 78.2 | 71.9 | 83.6 | 76.8 | 84.5 |
| Fert. mat. .................. | 66.9 | 71.3 | 69.5 | 70.5 | 69.6 | 70.6 |

### Industrial Trends

**Business:** Activity continued its upward trend again last month. The index of business activity of the *Journal of Commerce* registered its 6th consecutive gain on Aug. 26 when it reached 78.4, as compared with 101.8 for the corresponding week of '37. The index of the *Times* also shows that business at the moment is at the highest peak for the year, but is still a long way from the level of the same period a year ago.

**Steel:** Operations showed encouraging week to week gains and at the month-end mills were at 43% of capacity. While this is but about half of the rate prevailing a year ago, it is the highest point reached so far in '38. Heavy sales to the automotive field are anticipated over the final quarter which should boost the rate still further. The industry expects to hit the 60% mark some time during the last 3 months of the year.

**Automobiles:** August was, of course, a decidedly poor month from actual production figures. Producers are rushing '39 models, anticipating current stocks in dealers' hands will not be sufficient for the late fall demand they expect will develop.

**Retail Trade:** With relief from excessive heat, sales picked up in an encouraging fashion in the last half of the month. Sales are now only 2-9% below corresponding period of last year.

**Wholesale Trade:** Heartened by the size of the recovery movement, retailers are revising estimates of their requirements for the fall season, with the result that wholesalers are experiencing the thrill of expanding orders instead of mulling over cancellations.

**Employment:** Jobs and payrolls mounted in the "slow" July month. According to Dept. of Labor reports some 40,000 went back to work and weekly wages rose almost $500,000. Madam Perkins hailed this as "a definite improvement in the employment situation."

## State of Chemical Trade

**Current Statistics (August 31, 1938)—p. 18**

**Textiles:** All lines show gains. Rayon yarn demand, which resulted in record-breaking deliveries to mills in July, is continuing to expand at a rate which convinces producers that their showing for the second half will be decidedly favorable. Silk mills were more active in August and consumed 38,504 bales, the largest mill takings since April, '37. Wool and cotton are also enjoying mild booms.

**Glass:** The *American Glass Review* states: "Production prospects in the several divisions of the glass industry are much brighter." Plate glass is expected to show better gains than window glass. Output of safety glass is on the way up in keeping with the improved outlook in the automotive field.

**Rubber:** Marked improvement in replacement sales and better sentiment over the outlook caused a contraseasonal expansion in the consumption of crude rubber in July. This was the first time in 13 years that July consumption has shown a gain over June. The August consumption figure is confidently expected by the trade to have been higher than July total.

**Construction:** News from this field becomes more encouraging and an active fall season is expected.

**Paper:** Operations, while still below the corresponding period of '37, are now at 65% of capacity with the chances for further expansion very bright.

**Leather:** Many shoe producers are back on full schedules. Tanners expect buyers will be forced into the market in a large way very shortly and are stepping up production accordingly.

**Carloadings:** Current figures are running about 23% below last year's.

**Electrical Output:** Consumption is increasing with the improvement in manufacturing. Current weekly totals are about 7% below '37.

**Commodity Prices:** The rising markets have in many cases leveled off. In some instances reactions have taken place.

**Outlook:** It now appears that many statisticians have underestimated the July-August gains. The contraseasonal improvement promises a busy fall period. The most serious question mark at the moment is the foreign situation. In the past few weeks Europe has jumped from one crisis to another. At the moment it has all the appearances of a tinder box. Despite the adverse news the business world seems confident that the next 6 months at least will be an improvement over the corresponding months a year ago.

### MONTHLY STATISTICS (cont'd)

| FERTILIZER: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| *Exports* (short tons, Nat. Fert. Association) | | | | | | |
| Fertilizer and fert. materials.. | ........ | 168,654 | 99,717 | 120,301 | 127,496 | 166,234 |
| Ammonium sulfate ......... | ........ | 10,138 | 1,131 | 4,003 | 146 | 7,336 |
| Total phosphate rock ....... | ........ | 126,240 | 82,876 | 80,357 | 97,038 | 139,301 |
| Total potash fertilizers .... | ........ | 15,009 | 2,070 | 19,193 | 4,437 | 7,716 |
| *Imports* (short tons, Nat. Fert. Association) | | | | | | |
| Fertilizer and fert. materials.. | ........ | 90,686 | 86,484 | 119,153 | 126,150 | 176,659 |
| Ammonium sulfate ........ | ........ | 11,068 | 8,682 | 6,320 | 7,393 | 6,492 |
| Sodium nitrate .............. | ........ | 3,098 | 55,063 | 52,578 | 3,025 | 85,121 |
| Total potash fertilizer ..... | ........ | 32,581 | 6,403 | 9,646 | 1,669 | 13,992 |
| *Superphosphate e* (Nat. Fert. Association) | | | | | | |
| Production, bulk .............. | ........ | 242,651 | 227,223 | 286,685 | 227,223 | 286,685 |
| Shipments, total ............. | ........ | 169,264 | 410,067 | 482,824 | 410,067 | 482,824 |
| Northern area .............. | ........ | 88,447 | 262,122 | 312,329 | 262,122 | 312,329 |
| Southern area ............... | ........ | 80,817 | 147,945 | 170,495 | 147,945 | 170,495 |
| Stocks, end of month, total .. | ........ | 1,094,702 | 1,158,054 | 932,764 | 1,034,204 | 804,816 |
| *Tag Sales* (short tons, Nat. Fert. Association) | | | | | | |
| Total, 17 states ................ | 75,932 | 62,677 | 117,078 | 115,827 | 331,568 | 309,542 |
| Total, 12 southern ........... | 59,232 | 52,776 | 116,361 | 114,802 | 275,761 | 265,502 |
| Total, 5 midwest ............. | 16,700 | 9,901 | 717 | 1,025 | 55,807 | 44,040 |
| Fertilizer payrolls ............. | 63.0 | 77.1 | 66.3 | 79.2 | 95.7 | 116.2 |
| Fertilizer employment ........ | 57.1 | 69.8 | 62.3 | 75.7 | 90.4 | 104.6 |
| Value imports, fert. and mat. *d* | $1,351 | $2,002 | $1,885 | $2,616 | $2,880 | $3,916 |

| GENERAL: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| Acceptances outst'd'g *f*........ | $265 | $352 | $264 | $364 | $268 | $385 |
| Coal prod., anthracite, tons .. | 2,360,764 | 2,748,000 | 3,868,567 | 4,040,363 | 3,821,416 | 3,690,521 |
| Coal prod., bituminous, tons .. | 23,460,000 | 31,990,000 | 22,850,000 | 31,776,000 | 21,266,000 | ........ |
| Com. paper outst'd'g *f*........ | $211 | $325 | $225 | $284 | $251 | $286 |
| Failures, Dun & Bradstreet ... | 995 | 618 | 1,018 | 670 | 1,053 | 834 |
| Factory payrolls *i*............ | 67.5 | 100.4 | 67.2 | 102.9 | 69.2 | 105.2 |
| Factory employment *i*......... | 76.4 | 101.4 | 75.9 | 101.4 | 77.5 | 102.3 |
| Merchandise imports *i*......... | $140,836 | $265,214 | $145,898 | $286,224 | $148,260 | $284,735 |
| Merchandise exports *i*......... | $227,780 | $268,184 | $232,686 | $265,341 | $257,177 | $289,922 |

| GENERAL MANUFACTURING: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| Automotive production ........ | 141,437 | 438,968 | 174,667 | 497,312 | 192,068 | 516,919 |
| Boot and shoe prod., pairs ... | 30,000,000 | 34,842,000 | 26,676,651 | 34,449,040 | 30,196,147 | 35,410,552 |
| Bldg. contracts, Dodge *j*...... | $239,799 | $321,603 | $251,006 | $317,742 | $283,156 | $244,112 |
| Newsprint prod., U. S., tons.. | 86,256 | 78,205 | ........ | 78,500 | 68,001 | 79,024 |
| Newsprint prod., Canada, tons | 202,546 | 316,194 | 201,546 | 310,871 | 207,678 | 310,650 |
| Plate glass prod., sq. ft...... | 5,505,768 | 15,344,855 | 5,956,386 | 19,392,254 | 3,866,052 | 19,437,246 |
| Steel ingot prod., tons ....... | 1,982,058 | 4,556,304 | 1,638,277 | 4,184,223 | 1,806,805 | 5,151,909 |
| % steel capacity ............. | 33.42 | 78.48 | 28.46 | 74.48 | 30.39 | 88.79 |
| Pig iron prod., tons .......... | 1,201,785 | 3,498,858 | 1,062,021 | 2,107,506 | 1,255,024 | 3,537,231 |
| U.S. consumpt. crude rub., tons | 32,209 | 43,650 | 30,629 | 51,860 | 28,947 | 51,795 |
| Cotton consumpt., bales ...... | 449,511 | 583,011 | 442,742 | 680,521 | 425,684 | 669,665 |
| Cotton spindles oper. ......... | 21,916,166 | 24,394,300 | 21,143,988 | 24,558,398 | 21,341,750 | 24,656,284 |
| Silk deliveries, bales ........... | 32,593 | 31,399 | 31,492 | ........ | 28,687 | ........ |
| Rayon ship., index *p*.......... | 843 | 697 | 473 | 693 | 444 | 724 |
| Rayon employment *i*.......... | 289.8 | 401.0 | 284.2 | 391.4 | 304.0 | 384.0 |
| Rayon payrolls *i*............... | 266.1 | 392.9 | 258.1 | 391.8 | 275.0 | 382.0 |
| Soap employment *i*........... | 93.4 | 102.4 | 91.7 | 102.5 | 91.7 | 103.3 |
| Soap payrolls, *i*............... | 109.0 | 116.9 | 107.1 | 115.1 | 107.2 | 113.8 |
| Paper and pulp employment *i*.. | 104.2 | 119.5 | 104.5 | 120.5 | 105.4 | 120.2 |
| Paper and pulp payrolls *i*..... | 98.3 | 119.2 | 96.4 | 124.3 | 98.7 | 121.8 |
| Leather employment .......... | 75.6 | 94.7 | 73.9 | 98.0 | 74.0 | 99.1 |
| Leather payrolls *i*.............. | 79.3 | 104.0 | 76.1 | 108.4 | 74.7 | 110.0 |
| Glass employment *i*........... | 74.2 | 107.9 | 79.5 | 112.4 | 80.9 | 112.3 |
| Glass payrolls *i*................ | 68.5 | 108.6 | 77.1 | 119.4 | 78.5 | 118.9 |
| Rubber prod. employment *i*.... | 68.1 | 96.2 | 70.6 | 101.2 | 71.5 | 103.6 |
| Rubber prod. payrolls *i*........ | 62.6 | 96.8 | 63.2 | 103.8 | 63.1 | 109.2 |
| Dyeing and fin. employment *i* | 96.8 | 109.1 | 97.8 | 109.7 | 101.7 | 118.8 |
| Dyeing and fin. payrolls, *i*.... | 78.9 | 94.1 | 76.7 | 95.8 | 83.1 | 106.2 |

| MISCELLANEOUS: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| Oils & Fats Index ('26=100)... | 63.9 | ........ | 60.2 | ........ | 60.6 | ........ |
| Gasoline prod., bbls. .......... | ........ | ........ | 45,718 | 47,273 | 48,159 | 46,929 |
| Cottonseed oil consumpt., bbls. | 332,986 | ........ | ........ | ........ | 273,266 | 189,000 |

| PAINT, VARNISH, LACQUER, FILLERS: | July 1938 | July 1937 | June 1938 | June 1937 | May 1938 | May 1937 |
|---|---|---|---|---|---|---|
| Sales 680 establishments ...... | ........ | $36,004,636 | $33,936,706 | $41,656,085 | $36,827,421 | $45,254,635 |
| Trade sales (580 establishments) | ........ | $18,502,323 | $20,167,900 | $22,348,182 | $22,900,709 | $24,206,972 |
| Industrial sales, total ........ | ........ | $14,186,572 | $9,763,856 | $15,343,359 | $10,135,607 | $16,785,249 |

*a* Bureau of Mines; *b* Crude and refined plus motor benzol, Bureau of Mines; *c* Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly; *d* 000 omitted, Bureau of Foreign & Domestic Commerce; *e* Expressed in equivalent tons of 16% A.P.A.; *f* 000,000 omitted at end of the month; *i* U. S. Dept. of Labor, 3 year average, 1923-25 = 100; *j* 000 omitted, 37 states; *p* Rayon Organon, 1923-25 = 100; *q* 680 establishments, Bureau of the Census; *r* Classified sales, 580 establishments. Bureau of the Census; *s* 53 manufacturers, Bureau of the Census; *v* In thousands of bbls., Bureau of the Census; ** Indices, Survey of Current Business, U. S. Dept. of Commerce.

## Price Trend of Representative Chemical Company Stocks

| | July 30 | Aug. 5 | Aug. 12 | Aug. 19 | Aug. 26 | Aug. 31 | Net gain or loss last mo. | Price on Aug. 31, 1937 | 1938 High | 1938 Low |
|---|---|---|---|---|---|---|---|---|---|---|
| Air Reduction .. | 61 | 62¼ | 58⅞ | 61½ | 63 | 60¾ | —1½ | 73⅞ | 65¾ | 40 |
| Allied Chemical | 177 | 180 | 172 | 179½ | 181½ | 173¼ | —6¾ | 226 | 184 | 124 |
| Am. Cyan'd "B" | 24⅛ | 24⅜ | 22⅛ | 22½ | 22⅞ | 22¼ | —2⅛ | 35⅜ | 26⅝ | 15½ |
| Am. Agric. Chem. | 81¾* | 84¾ | 77¼ | 79 | 80¾ | .. | .. | 94 | 84¾ | 49 |
| Colum. Carbon . | 92† | 90½ | 89½ | .. | 92 | 90 | —½ | 117½ | 98½ | 53¾ |
| Com'l Solv. .... | 11¾ | 11⅞ | 10 | 10½ | 10⅞ | 10 | —1⅞ | 13¼ | 12¼ | 5⅞ |
| Dow Chemical .. | 135* | 134 | .. | 132 | .. | 129 | —5 | 117½ | 140⅛ | 87⅞ |
| Du Pont ...... | 126¾ | 131⅜ | 123½ | 130½ | 133⅞ | 130⅝ | —¾ | 155 | 135¾ | 90½ |
| Hercules Powder | 60⅛* | .. | 59 | 62 | 62⅞ | 62½ | +2⅜ | 162 | 65¼ | 42¾ |
| Mathieson Alka. | 28¼ | 29½ | 26¾ | 27¾ | 29¾ | .. | .. | 35⅞ | 30½ | 19¾ |
| Monsanto Chem. | 89⅜ | 95 | 91½ | 93¾ | 96¼ | .. | .. | 104½ | 98½ | 67 |
| Std. of N. J. .. | 57 | 57½ | 53 | 54¾ | 54⅛ | 52¼ | —4¾ | 65⅛ | 58⅜ | 39¾ |
| Tex. Gulf Sulph. | 35⅜ | 36½ | 35½ | 35 | 36¾ | 35 | —⅜ | 37¾ | 37½ | 26 |
| Union Carbide . | 83¼ | 84⅞ | 80 | 82½ | 83½ | 81⅝ | —1⅝ | 98 | 87 | 57 |
| U. S. Ind. Alco. | 20¾ | 21¾ | 19½ | — | 23¼ | 21¾ | +1 | 33 | 24¼ | 13½ |

* Close Friday, July 29.
† Close July 27.

## Earnings Statements Summarized

| Company | Annual dividends | Net income 1938 | Net income 1937 | Common share earnings 1938 | Common share earnings 1937 | Surplus after dividends 1938 | Surplus after dividends 1937 |
|---|---|---|---|---|---|---|---|
| **Air Reduction:** | | | | | | | |
| June 30 quarter ........ | y$2.00 | $888,757 | $2,289,498 | $.35 | $.90 | ...... | ...... |
| ‡‡Six months June 30 .. | y2.00 | 1,684,347 | 4,240,437 | .66 | 1.67 | ...... | ...... |
| **American Agricultural Chemical:** | | | | | | | |
| Year June 30 ........ | y7.50 | 1,401,075 | 1,868,944 | h6.69 | h8.86 | d$179,295 | $814,290 |
| **American Maize Products:** | | | | | | | |
| Six months, June 30 .... | y.25 | 164,609 | †229,385 | .54 | .... | ...... | ...... |
| **American Potash & Chemical:** | | | | | | | |
| Six months, June 30 .... | y3.00 | 940,746 | 1,213,788 | 1.78 | 2.29 | ...... | ...... |
| **American Smelt. & Ref.:** | | | | | | | |
| Six months, June 30 ... | y4.50 | 5,112,668 | 9,624,998 | 1.53 | 3.38 | ...... | ...... |
| **American Zinc, Lead & Smelt.:** | | | | | | | |
| June 30 quarter ......... | f.... | †64,687 | 81,074 | .... | r1.25 | ...... | ...... |
| ‡‡Six months, June 30 .. | f.... | †51,634 | 173,605 | .... | s2.85 | ...... | ...... |
| Twelve months June 30 .. | f.... | †40,308 | 258,577 | .... | r3.99 | ...... | ...... |
| **Atlantic Refining:** | | | | | | | |
| Six months, June 30 ... | 1.00 | 2,863,511 | 3,436,756 | .96 | 1.18 | ...... | ...... |
| **Certain-teed Products:** | | | | | | | |
| June 30 quarter ........ | f.... | 106,619 | 163,056 | p1.46 | .08 | ...... | ...... |
| Six months, June 30 .... | f.... | †82,969 | 170,072 | .... | p2.33 | ...... | ...... |
| **Colgate-Palmolive-Peet:** | | | | | | | |
| Six months, June 30 ... | e.25 | 1,646,421 | 1,715,696 | .47 | .50 | 915,921 | 487,413 |
| **Columbian Carbon:** | | | | | | | |
| **June 30 quarter ...... | y4.75 | 669,917 | 1,072,150 | 1.24 | 1.99 | ...... | ...... |
| Six months, June 30 .... | y4.75 | 1,377,072 | 2,520,686 | 2.56 | 4.69 | 302,773 | 910,481 |
| **Compressed Industrial Gases:** | | | | | | | |
| Six months, June 30 .... | .... | 13,901 | 283,455 | h.05 | h1.80 | ...... | ...... |
| Twelve months, June 30 .. | .... | 243,371 | 497,133 | h.93 | h3.15 | ...... | ...... |
| **Continental-Diamond Fibre:** | | | | | | | |
| June 30 quarter ........ | e.25 | †198,371 | 142,437 | .... | .31 | ...... | ...... |
| Six months, June 30 .... | e.25 | †437,126 | 323,625 | .... | .71 | ...... | ...... |
| **Cook Paint & Varnish:** | | | | | | | |
| Twenty-eight wks., June 30 | y.90 | 60,274 | x312,509 | .... | .... | ...... | ...... |
| Twelve months, June 30 .. | y.90 | 197,003 | *...... | .... | .... | ...... | ...... |
| **Davison Chemical:** | | | | | | | |
| Year, June 30 .......... | f.... | 87,760 | 578,943 | .17 | 1.13 | ...... | ...... |
| **Dow Chemical:** | | | | | | | |
| Year, May 31 ......... | y3.00 | 3,895,269 | 4,089,113 | 3.91 | 4.15 | 862,407 | 1,043,018 |
| **Formica Insulation:** | | | | | | | |
| Six months, June 30 .... | f.... | 1,229 | 129,277 | .01 | .72 | ...... | ...... |
| **Industrial Rayon:** | | | | | | | |
| June 30 quarter ......... | e.75 | †1,511 | †286,633 | .... | .... | ...... | ...... |
| Six months, June 30 .... | e.75 | †120,450 | 181,371 | .... | .24 | ...... | ...... |
| **Interchemical Corp.:** | | | | | | | |
| **June 30 quarter ........ | e.50 | 59,458 | 361,397 | p.90 | .91 | ...... | ...... |
| Six months, June 30 .... | e.50 | 71,253 | 766,484 | p1.08 | 1.96 | d128,673 | 277,025 |
| Twelve months, June 30 .. | e.50 | 142,028 | 1,479,886 | p2.15 | 3.73 | ...... | ...... |
| **International Salt Co.:** | | | | | | | |
| Six months, June 30 .... | y1.75 | 163,611 | 168,130 | .68 | .70 | ...... | ...... |
| **Liquid Carbonic:** | | | | | | | |
| June 30 quarter ........ | y1.60 | 594,780 | 788,556 | .85 | 1.12 | ...... | ...... |
| Nine months, June 30 ... | y1.60 | 696,985 | 979,559 | .99 | 1.40 | ...... | ...... |
| **Paraffine Companies, Inc.:** | | | | | | | |
| Year, June 30 ........ | y2.50 | 1,255,001 | 2,608,395 | 2.44 | 5.28 | ...... | ...... |
| **Phelps Dodge Corp.:** | | | | | | | |
| Six months, June 30 ... | y.80 | 3,830,588 | 7,101,458 | .75 | 1.40 | ...... | ...... |
| Twelve months, June 30 .. | y.80 | 9,469,902 | *...... | 1.87 | *.... | ...... | ...... |
| **Phillips Petroleum:** | | | | | | | |
| **June 30 quarter ...... | y2.25 | 3,270,497 | 7,063,443 | .74 | 1.59 | ...... | ...... |
| Six months, June 30 ... | y2.25 | 5,585,139 | 12,679,080 | 1.26 | 2.85 | ...... | ...... |
| **Ruberoid Co.:** | | | | | | | |
| June 30 quarter ........ | e1.70 | 199,037 | 341,772 | .50 | .86 | ...... | ...... |
| Six months, June 30 .... | e1.70 | 5,279 | 474,427 | .01 | 1.19 | ...... | ...... |
| **Standard Oil of Indiana:** | | | | | | | |
| Six months, June 30 .... | y1.75 | 17,749,093 | 27,904,211 | h1.16 | h1.83 | ...... | ...... |
| **United Chemicals:** | | | | | | | |
| **June 30 quarter ....... | f.... | 1,658 | 23,803 | .... | .... | ...... | ...... |
| Six months, June 30 .... | f.... | 3,141 | 45,053 | .... | .... | ...... | ...... |
| **Vanadium Corp. of America:** | | | | | | | |
| Six months, June 30 .... | y1.00 | †5,794 | 612,400 | .... | 1.62 | ...... | ...... |
| **Virginia-Carolina Chemical:** | | | | | | | |
| Year, June 30 .......... | f.... | 404,861 | 1,254,040 | p1.90 | p5.87 | ...... | ...... |

‡‡ Indicated earnings from quarterly statements; *y*, amount paid or payable on 12 months to and including the payable date of the most recent dividend announcement; *h*, on shares outstanding at close of respective periods; *d*, deficit; † net loss; *f*, no common dividend; *r*, on first preferred stock; *s*, on second preferred stock; *p*, on preferred stock; *e*, paid in last 12 months; *x*, payable on preferred stock; * not available; ** indicated quarterly earnings as shown by comparison of reports.

## Dividends and Dates

| Name | Div. | Stock Record | Payable |
|---|---|---|---|
| Abbott Sales, q. ... | 40c | Sept. 14 | Sept. 30 |
| Abbott Labs., pfd., q. ....... | $1.12½ | Oct. 1 | Oct. 15 |
| Archer-Daniels-Midland ........ | 25c | Aug. 20 | Sept. 1 |
| Armour & Co., (Del) pfd., q. ....... | $1.75 | Sept. 10 | Oct. 1 |
| Atlas Powder Co. . | 50c | Aug. 31 | Sept. 10 |
| Can. Industries A & B ........ | $1.25 | Aug. 31 | Sept. 30 |
| Carman & Co., Class A ac. ... | $1.00 | Aug. 15 | Sept. 1 |
| Celanese Corp. Am., 7% pt. pfd. | | (no action | June 6) |
| Champion Pap. & Fibre ............. | | (no action | April 12) |
| Champion Paper & Fibre, pfd., q. .. | $1.50 | Sept. 15 | Oct. 1 |
| Colgate-Palmolive-Peet, pfd., q. .. | $1.50 | Sept. 6 | Oct. 1 |
| Columbian Carbon q. ............ | $1.00 | Aug. 19 | Sept. 10 |
| Commercial Solvents .. | | (no action | May 25) |
| Cook Paint & Varnish q. .............. | 15c | Aug. 19 | Sept. 1 |
| Cook Paint & Varnish pfd., q. ....... | $1.00 | Aug. 19 | Sept. 1 |
| du Pont, I ........ | 75c | Aug. 22 | Sept. 14 |
| du Pont, deb., q. . | $1.50 | Oct. 10 | Oct. 25 |
| Eagle Picher Lead ..... | | (no action | May 26) |
| Flintkote Co. ......... | | (no action | June 1) |
| Freeport Sulphur, q. | 50c | Aug. 15 | Sept. 1 |
| General Paint Corp. ... | | (no action | June 9) |
| Heyden Chem. Corp. ........... | 10c | Aug. 27 | Sept. 10 |
| Int'l Nickel of Canada .......... | 50c | Aug. 31 | Sept. 30 |
| Int'l Salt Co., q. ... | 37½c | Sept. 15 | Oct. 1 |
| Johns Manville, pfd., q. ............. | $1.75 | Sept. 16 | Oct. 1 |
| Lindsay Light & Chem., pfd., q. ... | 17½c | Sept. 3 | Sept. 20 |
| Liquid Carbonic .... | 20c | Sept. 19 | Sept. 26 |
| Mathieson Alkali q. .............. | 37½c | Sept. 7 | Sept. 30 |
| Mathieson Alkali, pfd., q. ............. | $1.75 | Sept. 7 | Sept. 30 |
| McKesson & Robbins pfd., q. ............. | | Sept. 1 | Sept. 15 |
| Merck & Co. ..... | | (action deferred | June 14) |
| Monsanto Chem. q. | 50c | Sept. 1 | Sept. 15 |
| Monsanto Chem., pfd., s ............. | $2.25 | Nov. 10 | Dec. 1 |
| National Lead ..... | 12½c | Sept. 16 | Sept. 30 |
| Nat. Lead Cl. A, pfd., q ........ | $1.75 | Sept. 2 | Sept. 15 |
| Nat. Lead Cl. B, pfd., q ......... | $1.50 | Oct. 14 | Nov. 1 |
| Nat. Oil Products I ............... | 20c | Sept. 20 | Sept. 30 |
| N. J. Zinc Co. .... | 50c | Aug. 19 | Sept. 10 |
| Paraffine Cos. ..... | 50c | Sept. 10 | Sept. 27 |
| Paraffine Cos. pfd., q. ........ | $1.00 | Oct. 1 | Oct. 15 |
| Parker Rust Proof ........... | 20c | Aug. 10 | Sept. 1 |
| Patterson-Sargent, q. ........ | 25c | Aug. 15 | Sept. 1 |
| Penick-Ford ...... | 75c | Sept. 1 | Sept. 15 |
| Penn Salt Mfg ... | $1.00 | Aug. 31 | Sept. 15 |
| Procter & Gamble 5% pfd., q. ... | $1.25 | Aug. 25 | Sept. 15 |
| St. Joseph Lead ... | 25c | Sept. 9 | Sept. 20 |
| Sherwin-Williams 5%, q. ........ | $1.25 | Aug. 15 | Sept. 1 |
| Socony-Vacuum .... | 25c | Aug. 18 | Sept. 15 |
| Spencer Kellogg & Sons ............ | 30c | Aug. 24 | Sept. 9 |
| Staley Mfg Co., q. | $1.25 | Sept. 10 | Sept. 20 |
| Standard Oil of Calif. E ......... | 10c | Aug. 15 | Sept. 15 |
| Standard Oil of Calif., q. ....... | 25c | Aug. 15 | Sept. 15 |
| Standard Oil of Ind., q. .......... | 25c | Aug. 5 | Sept. 15 |
| Standard Oil of Kentucky, q. ..... | 25c | Aug. 31 | Sept. 15 |
| Standard Oil of Ohio, q. ........ | 25c | Aug. 31 | Sept. 15 |
| Standard Oil of Ohio, pfd., q. .. | $1.25 | Sept. 30 | Oct. 15 |
| Sun Oil Co., q. ... | 25c | Aug. 25 | Sept. 15 |
| Sun Oil pfd., q. .. | $1.50 | Aug. 10 | Sept. 1 |
| Texas Corp., q .... | 50c | Sept. 9 | Oct. 1 |
| Texas Gulf Sulphur q. ............... | 50c | Sept. 1 | Sept. 15 |
| Union Carbide ..... | 40c | Sept. 2 | Oct. 1 |
| United Dyewood pfd., q. ....... | $1.75 | Sept. 9 | Oct. 1 |
| United Dyewood pfd., q. ........ | $1.75 | Dec. 9 | Jan. 3, '39 |
| Westvaco Chlorine q. ............. | 25c | Aug. 10 | Sept. 1 |
| Will & Baumer Candle, pfd. ... | $2.00 | Sept. 15 | Oct. 1 |

ac—On accumulations.
I—Interim.
S—Semi-annual.

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# Chemical Stocks and Bonds

| Aug. 1938 Last | Aug. 1938 High | Aug. 1938 Low | 1937 High | 1937 Low | 1936 High | 1936 Low | Sales August 1938 (Number of shares) | Sales 1938 | Stocks | Par $ | Shares Listed | Dividends* | Earnings** $ per share 1937 | 1936 | 1935 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NEW YORK STOCK EXCHANGE** | | | | | | | | | | | | | | | |
| 52¼ | 52¾ | 36¼ | 55 | 36 | ... | ... | 6,300 | 18,000 | Abbott Labs. | No | 640,000 | $2.10 | 2.51 | 2.21 | 1.77 |
| 60¾ | 65¾ | 40 | 80¼ | 44½ | 86½ | 58 | 28,700 | 245,200 | Air Reduction | No | 2,566,191 | 3.00 | 2.86 | 2.79 | 2.05 |
| 173¼ | 184 | 124 | 258½ | 145 | 345 | 157 | 9,500 | 122,900 | Allied Chem. & Dye | No | 2,214,099 | 7.50 | 11.19 | 11.44 | 8.71 |
| 80¾ | 84¾ | 49 | 101½ | 53½ | 89 | 49 | 8,400 | 25,900 | Amer. Agric. Chem. | No | 210,932 | 7.75 | 8.86 | 4.71 | 6.37 |
| 11⅝ | 14¾ | 9 | 30¾ | 8¼ | 35⅜ | 20½ | 12,900 | 75,900 | Amer. Com. Alcohol | 20 | 260,930 | .50 | 3.23 | 4.55 | 3.16 |
| 28¾ | 31½ | 20 | 46 | 22 | 50 | 37 | 1,400 | 15,000 | Archer-Dan.-Midland | No | 549,546 | 2.00 | 5.03 | 3.05 | 4.20 |
| 57 | 58 | 36 | 94 | 38 | 84 | 48 | 1,900 | 19,400 | Atlas Powder Co. | No | 248,145 | 2.25 | 4.40 | 4.21 | 2.81 |
| 116⅜ | 119 | 105 | 133 | 101 | 131 | 112 | 150 | 1,950 | 5% conv. cum. pfd. | 100 | 68,597 | 5.00 | 20.90 | 20.85 | 16.93 |
| 22⅞ | 25¾ | 9 | 41¼ | 13 | 32¼ | 21¾ | 172,800 | 469,100 | Celanese Corp. Amer. | No | 1,000,000 | 2.25 | 2.04 | 2.33 | 1.99 |
| 95 | 95 | 82 | 115 | 90 | 116 | 106 | 1,800 | 2,650 | prior pfd. | 100 | 164,818 | 7.00 | 27.07 | 27.25 | 35.34 |
| 12 | 13¾ | 7⅛ | 25¾ | 8½ | 21¼ | 13 | 48,300 | 291,500 | Colgate-Palm.-Peet | No | 1,999,970 | .50 | —.35 | 1.40 | 1.36 |
| 95 | 96 | 78 | 104½ | 95 | 106½ | 100 | 2,100 | 12,000 | 6% pfd. | 100 | 248,197 | 6.00 | 3.21 | 17.13 | 16.79 |
| 92 | 98½ | 53¾ | 125¾ | 65 | 136½ | 94 | 2,700 | 39,600 | Columbian Carbon | No | 537,406 | 6.50 | 8.31 | 7.48 | 5.56 |
| 10 | 12¼ | 5⅞ | 21¼ | 5 | 24⅝ | 14¼ | 199,300 | 564,000 | Commercial Solvents | No | 2,636,878 | .60 | .60 | .85 | 1.02 |
| 69⅛ | 70⅝ | 53 | 71¼ | 50½ | 82½ | 63⅝ | 18,400 | 131,600 | Corn Products | 25 | 2,530,000 | 3.00 | 2.52 | 3.86 | 2.62 |
| 165½ | 167⅝ | 162 | 171½ | 153 | 170 | 158 | 400 | 3,600 | 7% cum. pfd. | 100 | 245,738 | 7.00 | 32.96 | 46.76 | 33.97 |
| 32½ | 39¼ | 25 | 76⅛ | 29½ | 63 | 42 | 1,360 | 16,900 | Devoe & Rayn. A | No | 95,000 | 3.25 | 4.05 | 4.49 | 2.89 |
| 129 | 140⅛ | 87⅞ | 159¼ | 79½ | 142¼ | 94⅛ | 4,500 | 56,100 | Dow Chemical | No | 945,000 | 3.35 | 4.17 | 4.48 | 3.29 |
| 130⅝ | 135¾ | 90½ | 180⅛ | 98 | 184¾ | 133 | 54,400 | 590,200 | DuPont de Nemours | 20 | 11,041,437 | 6.25 | 7.37 | 7.54 | 5.04 |
| 115¾ | 135¾ | 90½ | 112 | 107½ | ... | ... | 900 | 10,400 | 4½% pfd. | No | 500,000 | 4.50 | 165.48 | ...... | ...... |
| 135 | 137 | 130¾ | 135½ | 130 | 136½ | 129 | 3,100 | 23,500 | 6% cum. deb. | 100 | 1,092,948 | 6.00 | 81.70 | 84.21 | 56.81 |
| 171¼ | 181 | 121½ | 198 | 144 | 185 | 156 | 8,900 | 110,700 | Eastman Kodak | No | 2,250,921 | 7.50 | 9.76 | 8.23 | 6.90 |
| 169 | 171 | 157 | 164 | 150 | 166 | 152 | 100 | 1,860 | 6% cum. | 100 | 61,657 | 6.00 | 362.45 | 306.64 | 258.09 |
| 29½ | 31⅞ | 19⅞ | 32¼ | 18 | 35⅝ | 23½ | 18,800 | 159,700 | Freeport Texas | 10 | 796,380 | 1.50 | 3.30 | 2.43 | 1.78 |
| 9¾ | 12⅛ | 6¾ | 19 | 8½ | 18 | 9½ | 10,300 | 53,700 | Gen. Printing Ink | 1 | 735,960 | 1.20 | 1.32 | 1.32 | .97 |
| 22 | 27¼ | 13 | 51⅛ | 19⅛ | 55⅛ | 39½ | 14,100 | 134,200 | Glidden Co. | No | 799,701 | 2.60 | 2.62 | 3.29 | 2.74 |
| 46 | 51½ | 37 | 58⅛ | 43 | 56 | 52¼ | 400 | 5,300 | 4½% cum. pfd. | 50 | 199,940 | 2.25 | 12.72 | 15.43 | 13.23 |
| 96 | 98 | 76¾ | 117½ | 80⅛ | 133 | 99⅝ | 900 | 9,100 | Hazel Atlas | 25 | 434,474 | 6.56 | 6.67 | 6.55 | 7.58 |
| 62½ | 65¼ | 42¾ | 92½ | 50 | 75 | 42 | 5,300 | 110,100 | Hercules Powder | No | 1,316,710 | 2.62 | 2.97 | 3.24 | 2.12 |
| 133 | 134½ | 126¾ | 135½ | 125 | 135 | 126 | 670 | 2,520 | 6% cum. pfd. | 100 | 96,194 | 6.00 | 50.75 | 48.97 | 36.30 |
| 28¾ | 30⅜ | 14⅜ | 47½ | 15 | 41⅜ | 25⅝ | 37,900 | 168,900 | Industrial Rayon | No | 759,325 | 2.00 | .34 | 2.24 | 1.00 |
| 22 | 26½ | 15 | 64¼ | 20 | 48 | 37 | 4,100 | 45,000 | Interchem. | No | 289,058 | 2.00 | 1.44 | 3.02 | 2.21 |
| 85¼ | 98 | 80 | 111½ | 92 | 112 | 107 | 150 | 1,700 | 6% pfd. | 100 | 66,917 | 6.00 | 12.26 | 18.97 | 16.15 |
| 2⅝ | 3⅞ | 2 | 9⅛ | 2 | 5⅞ | 2⅞ | 12,300 | 80,900 | Intern. Agricul. | No | 438,048 | .... | .16 | —1.55 | —.99 |
| 24¾ | 29 | 15 | 63½ | 18⅛ | 47¼ | 22¾ | 2,100 | 23,300 | 7% cum. pr. pfd. | 100 | 100,000 | 3.00 | 7.70 | .23 | 2.69 |
| 48⅛ | 52¾ | 36⅞ | 73⅜ | 37 | 66⅜ | 43⅛ | 176,700 | 1,732,000 | Intern. Nickel | No | 14,584,025 | 2.25 | 3.31 | 2.40 | 1.65 |
| 25¾ | 25¾ | 19½ | 28¾ | 19½ | 30 | 23 | 2,700 | 10,500 | Intern. Salt | No | 240,000 | 1.75 | 2.17 | 1.70 | 1.32 |
| 23⅜ | 24 | 19¾ | 36 | 19¼ | 36¾ | 29¼ | 1,800 | 7,700 | Kellogg (Spencer) | No | 500,000 | 1.60 | 2.81 | 2.62 | 2.22 |
| 50⅞ | 54⅝ | 23¼ | 79 | 33⅝ | 80¼ | 47¼ | 53,500 | 246,400 | Libbey Owens Ford | No | 2,506,117 | 4.00 | 4.19 | 4.14 | 3.26 |
| 19 | 21½ | 12⅛ | 26⅞ | 14 | 46½ | 32½ | 18,800 | 80,200 | Liquid Carbonic | No | 700,000 | 2.75 | 2.37 | 1.58 | 1.29 |
| 29¾ | 30½ | 19¾ | 41¾ | 22 | 42⅜ | 27½ | 7,300 | 47,500 | Mathieson Alkali | No | 828,191 | 1.65 | 1.81 | 1.76 | 1.44 |
| 95½ | 98½ | 67 | 107½ | 71 | 103 | 79 | 16,700 | 137,800 | Monsanto Chem. | No | 1,114,388 | 3.00 | 4.40 | 4.01 | 3.45 |
| 115 | 116 | 111 | 109 | 105 | .... | ... | 1,170 | 11,300 | 4½% pfd. | No | 50,000 | 4.50 | 99.98 | ...... | ...... |
| 23⅞ | 31 | 17⅛ | 44 | 18 | 36½ | 26¾ | 62,700 | 386,400 | National Lead | 10 | 3,098,310 | .50 | .95 | 1.71 | 1.08 |
| 166 | 167 | 154 | 171 | 153 | 171 | 155 | 900 | 3,000 | 7% cum. "A" pfd. | 100 | 243,676 | 7.00 | 22.86 | 33.83 | 25.40 |
| 141⅝ | 141⅝ | 127 | 150 | 127 | 147 | 137¾ | 320 | 2,110 | 6% cum. "B" pfd. | 100 | 103,277 | 6.00 | 43.77 | 74.50 | 49.05 |
| 16⅜ | 19½ | 9⅞ | 41¾ | 10⅛ | 40 | 9 | 73,100 | 635,700 | Newport Industries | 1 | 519,347 | .50 | 2.22 | .98 | .57 |
| 70 | 74⅛ | 40 | 103¾ | 51¼ | 82 | 64 | 26,400 | 212,500 | Owens-Illinois Glass | 12.50 | 2,661,204 | 4.00 | 3.51 | 3.80 | 2.09 |
| 54 | 57½ | 39½ | 65½ | 43¼ | 56 | 40¼ | 16,900 | 141,600 | Procter & Gamble | No | 6,325,087 | 2.75 | 4.08 | 2.39 | 2.23 |
| 116½ | 122¼ | 115 | 118½ | 114½ | 122½ | 115¾ | 1,800 | 7,030 | 5% pfd. | 100 | 169,517 | 5.00 | 157.05 | 94.14 | 88.15 |
| 15⅞ | 18⅜ | 10 | 34⅜ | 14⅞ | 28¼ | 14¾ | 23,800 | 168,600 | Shell Union Oil | No | 13,070,625 | 1.00 | 1.44 | 1.35 | .37 |
| 104 | 105 | 93 | 105⅜ | 91 | 127½ | 102 | 1,300 | 17,600 | 5½% cum. pfd. | 100 | 379,798 | 5.00 | 60.59 | 57.20 | 17.92 |
| 25½ | 34¾ | 18½ | 60⅝ | 26½ | 47⅜ | 19½ | 14,300 | 127,400 | Skelly Oil | No | 1,006,348 | 1.50 | 6.07 | 4.42 | 2.17 |
| 91 | 93 | 84 | 102¼ | 88 | 132 | 97⅝ | 500 | 3,000 | 6% cum. pfd. | 100 | 66,300 | 6.00 | 97.86 | 73.16 | 39.00 |
| 30 | 35½ | 24¾ | 50 | 26½ | 48½ | 32¾ | 47,400 | 372,000 | S. O. Indiana | 25 | 15,235,323 | 2.30 | 3.06 | 3.09 | 1.98 |
| 52¼ | 58⅜ | 39¾ | 76 | 42 | 70⅜ | 51⅛ | 98,300 | 867,200 | S. O. New Jersey | 25 | 26,224,767 | 2.50 | 5.64 | 3.73 | 2.39 |
| 6⅛ | 8 | 3⅞ | 15⅜ | 5¼ | 13 | 5⅝ | 8,700 | 104,900 | Tenn. Corp. | 5 | 853,696 | .35 | 1.09 | .41 | .22 |
| 43 | 49⅝ | 32⅝ | 65⅛ | 34¾ | 55¼ | 28⅞ | 108,300 | 883,100 | Texas Corp. | 25 | 11,386,253 | 2.25 | 5.02 | 4.10 | 1.57 |
| 35 | 37½ | 26 | 44 | 23¾ | 44¾ | 33 | 27,600 | 254,200 | Texas Gulf Sulphur | No | 3,840,000 | 2.75 | 3.02 | 2.57 | 1.94 |
| 81⅝ | 87 | 57 | 111 | 61¼ | 105¼ | 71⅝ | 73,200 | 666,300 | Union Carbide & Carbon | No | 9,000,743 | 3.20 | 4.75 | 4.09 | 3.06 |
| 59 | 65½ | 39 | 91 | 36¾ | 96¾ | 68 | 24,300 | 76,100 | United Carbon | No | 397,885 | 4.50 | 5.30 | 5.54 | 4.71 |
| 21¾ | 24¼ | 13½ | 43⅝ | 16⅛ | 59 | 31¼ | 15,700 | 98,900 | U. S. Indus. Alcohol | No | 391,238 | .... | 1.24 | —.20 | 2.16 |
| 18¼ | 21⅜ | 11½ | 39⅞ | 9¼ | 30⅝ | 16¼ | 28,000 | 222,600 | Vanadium Corp. Amer. | No | 376,637 | 1.00 | 2.22 | .40 | —1.13 |
| 16 | 18½ | 14 | ... | ... | ... | ... | 7,200 | 13,800 | Victor Chem. | 5 | 696,000 | 1.12 | 1.01 | 1.16 | 1.13 |
| 3¾ | 5⅝ | 2¾ | 12¾ | 2⅜ | 8½ | 4⅛ | 12,300 | 137,800 | Virginia-Caro. Chem. | No | 486,708 | .... | —.05 | —2.44 | —.79 |
| 25¼ | 32⅛ | 15¾ | 74⅜ | 18½ | 58¾ | 28¾ | 13,800 | 109,300 | 6% cum. part. pfd. | 100 | 213,392 | 1.50 | 5.88 | .44 | 4.20 |
| 19 | 20⅛ | 10 | 27¼ | 10¾ | 32 | 19¾ | 3,400 | 23,200 | Westvaco Chlorine | No | 339,362 | 1.00 | 1.46 | 1.17 | 1.37 |
| 30⅛ | 30⅛ | 20 | 34⅞ | 21⅛ | 35¼ | 31¾ | 1,400 | 15,100 | cum. pfd. | 30 | 192,000 | 1.50 | 4.09 | 3.26 | 3.22 |
| **NEW YORK CURB EXCHANGE** | | | | | | | | | | | | | | | |
| 22¼ | 26⅝ | 15½ | 37 | 17⅝ | 40¾ | 29¼ | 32,500 | 315,700 | Amer. Cyanamid "B" | 10 | 2,520,368 | .60 | 2.09 | 1.77 | 1.61 |
| 82 | 82½ | 50 | 124 | 69 | 116¼ | 99¼ | 950 | 3,075 | Celanese, 7% cum. 1st pfd. | 100 | 148,179 | 7.00 | 22.32 | 24.47 | 21.96 |
| 4⅛ | 4½ | 3 | 15 | 3 | 16½ | 9 | 800 | 7,500 | Celluloid Corp. | 15 | 194,952 | .... | —.92 | —.80 | —.95 |
| 9 | 12 | 8¼ | 14⅝ | 10½ | 15 | 11⅞ | ...... | 900 | Courtaulds' Ltd. | £1 | 24,000,000 | 9½% | 8.64% | 8.30% | 7.51% |
| 7¼ | 9⅞ | 6 | 10⅝ | 3½ | 10¾ | 5 | 1,700 | 13,700 | Duval Texas Sulphur | No | 500,000 | .... | .43 | .61 | .16 |
| 37 | 37½ | 27 | 47½ | 31 | 55 | 39 | 600 | 4,200 | Heyden Chem. Corp. | 100 | 150,000 | 2.50 | 3.94 | 3.56 | 3.22 |
| 100½ | 106¾ | 55 | 147¼ | 77 | 140 | 98¼ | 7,500 | 73,100 | Pittsburgh Plate Glass | 25 | 2,142,443 | 6.50 | 8.53 | 7.15 | 5.32 |
| 105 | 115 | 66 | 154¾ | 72¼ | 154½ | 117 | 7,000 | 52,850 | Sherwin Williams | 25 | 633,927 | 6.00 | 8.44 | 8.04 | 6.19 |
| 113 | 114½ | 107 | 114 | 106¾ | 116 | 110 | 260 | 1,690 | 5% cum. pfd. | 100 | 137,139 | 5.00 | 44.01 | 41.44 | 33.17 |
| **PHILADELPHIA STOCK EXCHANGE** | | | | | | | | | | | | | | | |
| 157 | 160 | 121½ | 179 | 115 | 179 | 114¾ | 400 | 3,075 | Pennsylvania Salt | 50 | 150,000 | 8.75 | 11.79 | 8.57 | 5.94 |

| Aug. 1938 Last | Aug. 1938 High | Aug. 1938 Low | 1937 High | 1937 Low | 1936 High | 1936 Low | Sales August 1938 | Sales 1938 | Bonds | Date Due | Int. % | Int. Period | Outstanding $ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NEW YORK STOCK EXCHANGE** | | | | | | | | | | | | | |
| 103½ | 105⅜ | 99¾ | 109½ | 99 | 117½ | 107¾ | 265,000 | 2,134,000 | Amer. I. G. Chem. Conv. | 1949 | 5½ | M-N | $25,300,000 |
| 35½ | 37½ | 25⅛ | 42½ | 23 | 42½ | 27¾ | 198,000 | 1,473,000 | Anglo Chilean Nitrate inc. deb. | 1967 | 4½-5 | J | 12,067,000 |
| 105⅛ | 106 | 102⅜ | 102⅞ | 100⅛ | ... | ... | 145,000 | 451,000 | Dow Chemical | 1951 | 3 | J-D | 5,000,000 |
| 101⅛ | 102¼ | 100 | 102 | 98½ | 102¾ | 96¾ | 19,000 | 177,000 | Int. Agric. Corp. 1st Coll. tr. stpd. to 1942 | 1942 | 5 | M-N | 5,633,000 |
| 30½ | 34 | 24¾ | 35¾ | 21¼ | 39 | 21 | 228,000 | 1,466,000 | Lautaro Nitrate n inc. deb. | 1975 | 4 | J-D | 30,500,000 |
| 23 | 23 | 20½ | 25½ | 20½ | 35 | 23½ | 1,000 | 23,000 | Ruhr Chem. | 1948 | 6 | A-D | 1,500,000 |
| 103⅞ | 104¾ | 96½ | 102 | 93 | 101¼ | 94¼ | 283,000 | 3,612,000 | Shell Union Oil | 1951 | 3½ | M-S | 58,800,000 |
| 103 | 103½ | 90¼ | 102¾ | 94 | 102⅞ | 96⅝ | 189,000 | 1,525,000 | Skelly Oil | 1951 | 4 | J-J | 9,000,000 |
| 102 | 102½ | 95 | 105 | 93½ | 105 | 103 | 20,000 | 187,000 | Tenn. Corp. deb. "B" | 1944 | 6 | M-S | 1,600,000 |
| 106⅜ | 107⅜ | 103½ | 105¾ | 100 | 106 | 101½ | 289,000 | 2,637,000 | Texas Corp. | 1951 | 3½ | J-D | 60,000,000 |
| 97 | 99½ | 77 | 111 | 81 | 98½ | 85¾ | 107,000 | 417,000 | Vanadium Corp. conv. | 1941 | 5 | A-O | 2,800,000 |

* Paid in 1937, including extras but excluding dividends paid in stock. ** For either fiscal or calendar years.

## U. S. Chemical Patents

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### Agricultural Chemicals

Production of a granular fertilizer; material selected from the group of ammonium nitrate and urea. No. 2,124,332. Frank J. DeRewal, Camillus, N. Y., to Solvay Process Co., New York City.

### Cellulose

Cellulose derivative compositions produced by coalescence of a cellulose derivative product having a weighting compound dispersed therein. No. 2,124,611. Camille Dreyfus, New York City.

Cellulose organic ester composition containing a dipropionate of a polyethylene glycol. No. 2,124,884. Lester W. A. Meyer, Kingsport, Tenn., to Eastman Kodak Co., Jersey City, N. J.

Removal cellulose derivatives from suspensions containing same; using an alkaline earth metal salt of a monobasic acid. No. 2,124,894. Stephen C. Pool and Maurice L. Piker to Eastman Kodak Co., all of Rochester, N. Y.

Manufacture of cellulosic materials of artificial origin formed from a cellulosic solution that would normally incur the contamination of spinneret orifices, using a cation-active substance. No. 2,125,031. James Joseph Polak, Arnhem, and Johannes G. Weeldenburg, Ede, Netherlands, to American Enka Corp., Enka, N. C.

Manufacture mixed aliphato-nitro cellulose. No. 2,125,880. Ernst Berl, Pittsburgh, Pa.

### Chemical Specialties

Stable parasiticidal composition, having a thio-diarylamine as the active parasiticidal ingredient, stabilized by a stable reducing derivative of a sulfur acid. No. 2,123,928. Euclid W. Bousquet to du Pont, both of Wilmington, Del.

Photochemically stabilized thio-diarylamine parasiticidal composition, having an amount of tetra-methyl diamino benzophenone incorporated therein as stabilizer. No. 2,123,929. Euclid W. Bousquet to du Pont, both of Wilmington, Del.

Foaming galvanizing flux for use on a galvanizing bath of molten metal, made from a predetermined amount of cottonseed meal and a chloride flux. No. 2,123,949. Raymond J. Kepfer, Lakewood, Ohio, to du Pont, Wilmington, Del.

Abrasive wheel; comprising abrasive grain and a bond of iron and ferric chloride. No. 2,124,279. Edward Van der Pyl, Holden, Mass., to Norton Co., Worcester, Mass.

Method producing photographic image carriers provided with precipitants for coloring dyes. No. 2,124,371. Richard Gschopf and Karl Pokorny, Vienna, Austria, Pokorny assignor to Gschopf.

Floor tile made of resinated sulfur, as the essential binder, associated with comminuted calcium sulfate material which contains water of crystallization. No. 2,124,384. Carleton Ellis, Montclair, N. J., to Ellis-Foster Co., corp. of N. J.

Insecticidal, fungicidal, disinfectant material: a cyclohexyl thiocyanate. No. 2,124,400. Leon C. Heckert, Pittsburg, Kans., and Charles H. Peet, Bristol, Pa., to Rohm & Haas Co., Phila, Pa.

Vermin exterminator which evolves hydrogen sulfide and carbon-monoxide upon being burned; comprising sulfur, a solid combustible carbon-containing substance, a substance able to give off oxygen, and one from the group of liquid oils and fusible fats of animal, vegetable and mineral origin. No. 2,124,494. Karl Memminger to Fahlberg-List Aktiengesellschaft Chemische Fabriken, both of Magdeburg-Sudost, Germany.

Treatment drill holes; introducing mud fluid consisting of water and clay. No. 2,124,495. Harold C. Miller, Oakland, Calif., assignor of ten per cent. to Gerald B. Shea, Oakland, Calif., twenty per cent. to James W. Weir, Los Angeles, Calif., twenty per cent. to Henry S. Montgomery, and twenty per cent. to Alfred W. Knight, both of South Pasadena, Calif.

Core binder; a viscous aqueous solution of the water-soluble tars obtained from pyroligneous acid. No. 2,124,515. Arthur W. Goos to Cliffs Dow Chem. Co., both of Marquette, Mich.

Treatment wells for removal of deposits consisting of mineral and organic matter; by introducing an aqueous acid and a water-insoluble solvent. No. 2,124.530. Albert G. Loomis and Harold T. Byck, Berkeley, and James F. Fidiam, Jr., San Francisco, Calif., to Shell Development Co., San Francisco, Calif.

Photographic developer for reversal process; comprising a developing agent and an aliphatic polyamine containing in its molecule two unsubstituted amino groups. No, 2,124,608. Jens Herman Christensen, Sterrehus, Holte, Denmark.

Lubricant capable of reducing corrosion in internal combusion engines; consisting of a mineral lubricating oil containing as an active anti-corrosion agent a polycarboxylic acid. No. 2,124,628. Franz Rudolf Moser, Amsterdam, Netherlands, to Shell Development Co., San Francisco, Calif.

Manufacture abrasive coated products; preparing an aqueous suspension of a solid phenolic resin in water, coating backing with abrasive grains and with the suspension, finally treating article with a solvent for the resin to make the resin adhesive. No. 2,124,666. Raymond C. Benner and Romie L. Melton, to Carborundum Co., all of Niagara Falls, N. Y.

Anti-parasitic oil composition for application in emulsified form to sensitive foliage; a refined petroleum white oil containing a mixture of aluminum naphthenate and glycerol oleate. No. 2,124,782. Hugh Knight, Claremont, Calif., to Emulsoids, Inc., San Francisco, Calif.

Method patching interior surfaces of furnaces; using a slurry of water and a powdered refractory material. No, 2,124,865. Frederick W. Winkler, Francis X. Mooney, and Charles R. Kuzell, Clarkdale, and Melvin T. Mounts, Cottonwood, Ariz., to Phelps Dodge Corp., New York City.

Manufacture formed mineral feed; during mixing operation spraying thereon hot paraffin, black-strap molasses and hydrol. No. 2,124,950. Merle Douglas Knapheide, Paul Caldwell and Wallace P. Elmslie, Quincy, Ill., to Moorman Mfg. Co., Chicago, Ill.

Preparation adhesives from sweet potatoes, by treating sifted flour with starch-converting reagents. No. 2,124,994. Howard S. Paine, Chevy Chase, Md., and Kyle Ward, Jr., Washington, D. C.; dedicated to free use of the People of the U. S..

Production multi-color moving picture films in a predyed multi-layer light sensitive silver halide material having at least three layers differently colored by dyestuffs. No. 2,125,015. Bela Gaspar, Brussels, Belgium.

Commutator or like carbon brush, consisting of carbon laminae bonded together by an intermediate layer of heat-resisting insulation material, incorporating a layer of insulating sheet material. No, 2,125,027. Ottomar Kasperowski, Munich, Germany.

Production porous building materials from plaster, water and aqueous hydrogen peroxide. No. 2,125,046. Dean De Forest Crandell to National Gypsum Co., both of Buffalo, N. Y.

Preparation pigmented lacquer base; a non-aqueous mix of nitrocellulose and unground pigment. No. 2,125,103. Emile de Stubner, New York City.

Lubricant of high film strength. No. 2,125,169. William J. Marsh, Niagara Falls, N. Y., to Hooker Electrochemical Co., New York City.

A paint which can be polished readily to give a semi-gloss after paint has dried to a point where it has lost its sheen, comprising lithopone, aluminum silicate, cooked linseed oil, flatting varnish, and beeswax. No. 2,125,237. Otto F. Gargen and Carl J. Ernst, Milwaukee, Wis.

Preparation gummed tape; applying a vegetable glue to a paper surface, then applying an animal glue which has been foamed, dried, and pulverized. No. 2,125,241. Ferdinand W. Humphner, Oak Park, Ill., to Mid-States Gummed Paper Co., corp. of Del.

Production cementitious materials: burning intimate mixture of siliceous and lime-carbonate-containing materials at temperature sufficient to calcine the carbonates, but insufficient to cause clinkering. No. 2,125,-281. John A. Blank, Ironton, Ohio, and Alton J. Blank, Pueblo, Mexico, to Cement Process Corp., corp. of Del.

Preparation pure free mahogany sulfonic acids. No. 1,125,300. George Andreas Kessler and Leo Salzmann, Butler, Pa., to L. Sonneborn Sons, corp. of Del.

Lubricating oil composition containing paraffinic constituents and an alkali metal mahogany sulfonate, being derived from a Pennsylvania paraffin base crude. No. 2,125,305. Thomas G. Murphy, Franklin, Pa., to L. Sonneborn Sons, corp. of Del.

Cleaning composition consisting of a gel containing water of an oleylaminoethyl sulfonic acid. No. 2,125,411. Ernest D. Wilson, Larchmont, N. Y., to W-B Chemical Co., New York City.

Method impregnating electric condensers; using castor oil in process. No. 2,125,413. William French Arnold, Mt. Vernon N. Y., to Cornell-Dubilier Corp., New York City.

Method improving strength of puzzolanic cementitious substances; reacting cementitious puzzolanic stock with a sulfur compound of a heavy metal. No. 2,125,520. Joseph L. Parker and Clarence H. Starns, Birmingham, Ala., to Southern Cement Co., corp. of Ala.

Chewing gum base containing water, rubber, and a cyclic aromatic petroleum resin. No. 2,125,562. George A. Hatherell, Roscoe, Calif., to Frank A. Garbutt, Los Angeles, Calif.

Floor and wall covering material, comprising filler and pigment moistened with an aqueous solution obtained by action of ethylene oxide on castor oil mixed with another material, an alkyd resin and a lacquer, said material being incorporated with a drier. No. 2,125,594. Hugo Strauch, Krefeld-Uerdingen, Germany, to I. G., Frankfort-on-Main, Germany.

Manufacture printing inks; subjecting charge of vulcanized rubber containing fabric and at least one oil to action of agitation and distillation by heat. No. 2,125,683. Cyril Frederick Percy Millar, Chorlton on Medlock, Manchester, England.

Laminated pressed wallboard; a lamina of fibre board containing a wood resin and a lamina of a composition containing a halogen containing rubber derivative. No. 2,125,847. John H. McKenzie, Chicago, to Marbon Corp., corp. of Del.

Extreme pressure lubricant comprising a mineral oil lubricant and polymerized aliphatic nitriles. No. 2,125,851. Anderson W. Ralston to Armour & Co., both of Chicago, Ill.

Preparation abrasive article of the soft-bond type from granules having as a bond an alkyd resin. No. 2,125,893. Rupert S. Daniels, East Orange, N. J., to Bakelite Corp., New York City.

Process of improving fastness of starch upon textiles; incorporating also a quaternary ammonium compound of the formula $R\text{-}X\text{-}CH_2\text{-}N\text{-}$(tert.)-Y. No. 2,125,901. John Gwynant Evans and Charles Edward Salkeld, Blackley, Manchester, England, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Production wood preservative impregnant of the creosote oil type from a mixture of tar fractions with boiling points above 210°C. and with coke residue in excess of 10%. No. 2,125,918. Jacquelin E. Harvey, Jr., Robert H. White, Jr., and John J. White, one-half to Southern Wood Preserving Co., and one-half to Jacquelin E. Harvey, Jr., all of Atlanta, Ga.

Non-corroding lubricating oil consisting of a lubricating oil containing paraffinic constituents and a cobalt mahogany sulfonate, lubricating oil being derived from a Pennsylvania paraffin base crude. No. 2,125,934. Leo Liberthson, New York City, to L. Sonneborn Sons, corp. of Del.

Non-corroding lubricating oil, consisting of a lubricating oil containing paraffinic constituents and a cadmium mahogany sulfonate, said lubricating oil being derived from a Pennsylvania paraffin base crude. No. 2,125,935. Leo Liberthson, New York City, to L. Sonneborn Sons, corp. of Del.

Non-corroding lubricating oil, consisting of a lubricating oil containing paraffinic constituents and a tin mahogany sulfonate, said oil being derived from a Pennsylvania paraffin base crude. No. 2,125,936. Leo Liberthson, New York City, to L. Sonneborn Sons, corp. of Del.

Plasticizer for rubber derivatives. No. 2,126,019. Arnold Kirkpatrick to Monsanto Chemical Co., both of St. Louis, Mo.

Safety glass whose sheets are bonded together through the medium of a layer of resinous polyvinyl acetal in admixture with a plasticizer of tributyl citrate. No. 2,126,028. Howard K. Nason to Monsanto Chemical Co., both of St. Louis, Mo.

Emulsifying agent comprising oil-soluble sulfonates derived from petroleum and an alcohol amine sulfonate derived also from petroleum. No. 2,126,054. Karl T. Steik, Montclair, and Stewart C. Fulton, Elizabeth, N. J., to Standard Oil Development Co., corp. of Del.

Sensitizing photographic material; silver halide emulsion containing a dye. No. 2,126,078. Walter Zeh, Dessau in Anhalt, Adolf Sieglitz, Frankfort-on-Main-Sindlingen, and Martin Dabelow, Frankfort-on-Main-Hochst, Germany, to Agfa Ansco Corp., Binghamton, N. Y.

Polish: mixture of barium stearate, paraffin, hard wax, colloidally dispersed in spirits of turpentine in a stable gelled condition. No. 2,126,096. Hubert Deguide, Enghien, France.

Metal polish and rust remover; dissolving oxalic acid in water to which tripoli has been added, afterwards adding oil of mirbane. No. 2,126,119. James I. Kushima, Honouliuli, Ewa, Oahu, T. H.

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Waterproofing composition for wood, having in combination glycerin, vinegar, Chinawood oil, fish oil, painter's thinner, rosin, lime, and petroleum thinner. No. 2,126,123. John McArthur, one-half to George C. Babcock, both of Vancouver, Washington.

Lubricant adapted for metal drawing operations under heavy pressure, consisting of stearic acid of high titre and mineral oil. No. 2,126,128. Harley A. Montgomery, Highland Park, Mich.

Non-corrosive, anti-freeze liquid; an alcohol and an inhibitor consisting of an additive mixture of an alkali metal nitrite, triethanolamine, and an acid. No. 2,126,173. Leo J. Clapsadle, Buffalo, N. Y., and Alvan H. Tenney, Pittsburgh, Pa., to Union Carbide and Carbon Corp., corp. of New York.

Process chemically graining a zinc lithographic plate; treating surface of plate with heated solution of a hydrolyzable acid phosphate of a divalent metal. No. 2,126,181. Walter Strickland Field, London, England, to Pyrene Co., Ltd., Brentford, England.

Composite cementitious article comprising an underlying cementitious layer, latter composed of a hydraulic cement and an overlying cementitious layer comprising a copper bearing magnesium oxychloride cement bonded to the hydraulic cement. No. 2,126,191. Dean S. Hubbell to H. H. Robertson Co., both of Pittsburgh, Pa.

Greaseproof gummed paper for labels, etc; strip of paper coated with a water-insoluble oil-resistant lacquer, a water-soluble adhesive on lacquer, and an organic solvent for lacquer remaining in adhesive for uniting latter to coating. No. 2,126,192. Ferdinand W. Humphner, Oak Park, Ill., to Mid-States Gummed Paper Co., corp. of Del.

Luminescent composition yielding a daylight shade; calcining mixture of zinc sulfide and cadmium sulfide so as to cause crystallization, mixture containing also silver and copper compounds. No. 2,126,233. Alfred Wakenhut, Seelze, near Hanover, Germany, to J. D. Riedel-E. de Haen A.-G., Berlin-Britz, Germany.

Production a light-sensitive emulsion; precipitating silver hydroxide in an aqueous solution, dissolving precipitate in an organic alkali, mixing solution with an inert carrier and adding an alkali metal halide to mixture to form an emulsion, then adding a semi-carbazide acid salt. No. 2,126,318. George E. Fallesen and Cyril J. Staud to Eastman Kodak Co., all of Rochester, N. Y.

Production light-sensitive emulsion; precipitating silver hydroxide in an aqueous solution, dissolving precipitate in an organic alkali, mixing solution with an inert carrier and adding an alkali metal halide to form an emulsion, then adding a salt. No. 2,126,319. George E. Fallesen and Burt H. Carroll to Eastman Kodak Co., all of Rochester, N. Y.

Color-forming photographic developer, comprising an aromatic amino developing compound containing a primary amino group and an ortho hydroxy styrene coupler compound. No. 2,126,337. Leopold D. Mannes, Leopold Godowsky, Jr., and Willard D. Peterson, to Eastman Kodak Co., all of Rochester, N. Y.

Method treating an exposed photographic element; immersing same in a processing solution containing an organic swelling agent for the cellulose ester. No. 2,126,349. Martti Salo, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Photographic roll film backing paper; an opaque paper coated with a layer of cellulose ethyl ether having an ethoxyl content of about 49%. No. 2,126,350. Paul C. Seel to Eastman Kodak Co., both of Rochester, N. Y.

### Coal Tar Chemicals

Manufacture 2-naphthol-sulfonic acids. No. 2,124,070. Adolf Krebser, Riehen, near Basel, and Franco Vannotti, Basel, Switzerland, to J. R. Geigy, S. A., Basel, Switzerland.

Production pyridino-anthraquinone derivatives. No. 2,124,238. Heinz Scheyer, Frankfort-on-Main, and Emil Schwamberger, Frankfort-on-Main-Fechenheim, Germany, to General Aniline Works, New York City.

Preparation N:N'-dialkyl-2:2'dipyrazole-anthronyls. No. 2,124,251. Jacob Koch, Basel, and Max Bommer, Riehen, near Basel, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.

Preparation arylides of hydroxy-ortho-carboxy-benzoacridones. No. 2,124,336. Max Lange, Frankfort-on-Main, and Theodor Jacobs, Wiesbaden, Germany, to General Aniline Works, New York City.

Volatile base salts of diazoamino compounds containing acid salt forming groups in the radicle attached to the amino nitrogen. No. 2,124,594. Albert Schmelzer, Cologne/Rhineland, Germany, to General Aniline Works, New York City.

Preparation methyl-aminonaphthalene-sulfonic acids. No. 2,124,863. Adolf Sieglitz, Frankfort-on-Main, Germany, to General Aniline Works, New York City.

Production of a sulfonation product of a compound obtained by condensation; sulfo acids. No. 2,125,072. Rudolf Kern, Oschatz, Germany, to Chemische Fabrik R. Baumheier, Kommanditgesellschaft, Oschatz-Zschollau, Germany.

Purification and separation hygroscopic aryl sulfonic acids from a slurry containing a mixture of precipitated sulfonic acid and a solution of impurities, filtering sulfonic acid from slurry under dehydrating conditions. No. 2,125,189. William M. Lofton, Jr., Chicora, Jennings H. Jones and Arthur K. Pyle, Petrolia, and Alvin A. Hoffmann, Bellevue, Pa., to Pennsylvania Coal Prods. Co., Petrolia, Pa.

Treatment commercial coal or coke; by application of a non-binding emulsion consisting of a quickly evaporating liquid and a slowly volatile petroleum oil; emulsion having viscosity sufficient to render coal dustless. No. 2,125,753. George P. Spencer, New York City.

Method thionating intermediates for sulfur colors. No. 2,125,924. Alfred J. Johnson, Woodstown, N. J., and George C. Strouse, Wilmington, Del., to du Pont, Wilmington, Del.

Production intermediates for azo dyes. No. 2,126,048. Wilfred Archibald Sexton, Manchester, England, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Production polycyclic compounds from chrysene; using condensing agent selected from the group of aluminum and ferric chlorides. No. 2,126,360. Heinrich Vollmann, Frankfort-on-Main, and Hans Becker, Hofheim-on-Taunus, Germany, to General Aniline Works, New York City.

### Coatings

Moisture-proof, water-insensitive wrapping tissue, having base film of low substituted cellulose ether having a coating thereon. No. 2,123,883. Deane C. Ellsworth, deceased, late of Wilmington, Del., by Joseph F. Haskins, administrator, Wilmington, Del., to du Pont, Wilmington, Del.

Manufacture abrasive article; coating a fibrous base with an emulsion of a penetrative varnish composition in a volatile non-solvent liquid, applying abrasive particles to varnish film, and hardening film. No. 2,124,055. Robert P. Courtney, Maplewood, N. J., to Bakelite Corp., New York City.

Metal foil; in combination, an alkyd resin, a condensation resin of formaldehyde with aromatic sulfonamides, linoleate of lead, and wax intimately applied to metal foil. No. 2,124,232. Harvey G. Kittredge and Frank W. Williams to Foilfilm, Inc., all of Dayton, Ohio.

Production strong and tough artificial resins; first conjointly polymerizing a vinyl halide and a vinyl ester of an aliphatic acid in presence of an oxygen-containing substance. No. 2,124,630. William M. Quattlebaum, Charleston, W. Va., to Union Carbide & Carbon Corp., corp. of New York.

Production high metallic luster on flexible sheet material. No. 2,125,341. Carroll B. Hall, Beaver Falls, and John Dorman McBurney, Newburgh, N. Y., to du Pont, Wilmington, Del.

Coating alkaline surfaces; marble impregnated with abietyl alcohol. No. 2,125,386. Paul La Frone Magill, Ransomville, N. Y., to du Pont, Wilmington, Del.

Method providing stable coatings of resins obtained by polymerizing vinyl chloride upon the surfaces of bodies of ferrous metal which normally tend to decompose the resin. No. 2,125,387. Martin W. Mason, Nutley, N. J., to Pittsburgh Plate Glass Co., corp. of Penn.

Preparation β-halogenated vinyl ketones. No. 2,125,393. Johannes Nelles and Otto Bayer, Leverkusen-I. G. Werk, Germany, to I. G., Frankfort-on-Main, Germany.

Production diazobiguanides. No. 2,125,509. Hans Z. Lecher, Plainfield, N. J., to Calco Chemical Co., Bound Brook, N. J.

Treatment absorbent materials with resin to produce a coated material with a glossy surface. No. 2,125,527. George Crawford Tyce, Norton-on-Tees, and Victor Lefebure, London, England, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Method coating articles; passing same through body of a heat-hardenable composition in liquid form and through body of a heated liquid immiscible with the coating composition without intermediate exposure. No. 2,125,827. Victor H. Turkington, Caldwell, N. J., to Bakelite Corp., New York City.

Manufacture hydrocarbon resins wherein liquid isobutylene is polymerized by catalytic action of an active metal halide in presence of from 55-95% butanes and normal butylenes at temperatures below 0°F. No. 2,125,872. Maurice H. Arveson to Standard Oil Co., both of Chicago, Ill.

Manufacture articles comprising an adherent cellulose derivative coating on a rigid base. No. 2,125,874. Bjorn Andersen, Maplewood, N. J., to Celluloid Corp., corp. of N. J.

Preparation co-polymer of at least two different monohydric aliphatic alcohol esters of alpha-methacrylic acid. No. 2,125,885. Herman A. Bruson, Elkins Park, Pa., to Rohm & Haas Co., Phila., Pa.

Lacquer comprising a cellulose ester, a volatile solvent including a water soluble ingredient, comminuted diatomaceous earth that contains a water-soluble silicate compound and aluminum stearate associated therewith; stearate being adapted to promote redispersion of the diatomaceous earth after being settled from the lacquer. No. 2,125,951. Robert E. Parry, North Plainfield, N. J., to Johns-Manville Corp., New York City.

Manufacture resinous products useful as varnish bases, from monoglyceryl tungate and phthalic acid, first blending an ester gum with the tungate prior to reacting with the acid. No. 2,126,242. Maurice John Bonham, Elkins Park, Pa., to McCloskey Varnish Co., Holmesburg Junction, Phila., Pa.

### Dyes, Stains, etc.

Production acid dyestuffs. No. 2,123,918. Paul Wolff and Friedrich Heim, Frankfort-on-Main, Germany, to General Aniline Works, New York City.

Production dyestuffs of the anthrimide carbazole series. No. 2,124,165. Ralph N. Lulek, Milwaukee, and Clarence F. Belcher, S. Milwaukee, Wis., to du Pont, Wilmington, Del.

Production condensation products of the anthraquinone series. No. 2,124,237. Heinz Scheyer, Frankfort-on-Main, and Emil Schwamberger, Frankfort-on-Main-Fechenheim, Germany, to General Aniline Works, New York City.

Production phthalocyanine dyestuffs. No. 2,124,299. Karl Holzach and Fritz Muehlbauer, Ludwigshafen-on-Rhine, Germany, to General Aniline Works, New York City.

Production coloring matters of the phthalocyanine series; subjecting an o-arylenedicyanide to action of heat in presence of a substance capable of yielding a magnetic metal. No. 2,124,419. Isidor Morris Heilbron, Manchester, England, Francis Irving, Grangemouth, Scotland, and Reginald Patrick Linstead, London, England, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Process finishing a basic dyestuff; dissolving completely purified dyestuff in hot low-boiling organic solvent, then recovering dyestuff in desirable physical form by removing solvent by distillation. No. 2,124,590. James Keel Reed, Carneys Point, N. J., to du Pont, Wilmington, Del.

Production hydroxy secondary disazo dyes. No. 2,124,688. Herbert W. Daudt, Wilmington, Del., and Harold E. Woodward, Penns Grove, N. J., to du Pont, Wilmington, Del.

Production brown azo dyes. No. 2,124,689. Herbert W. Daudt, Wilmington, Del., and Harold E. Woodward, Penns Grove, N. J., to du Pont, Wilmington, Del.

Production brown wool dye. No. 2,124,690. Herbert W. Daudt, Wilmington, Del., and Harold E. Woodward, Penns Grove, N. J., to du Pont, Wilmington, Del.

Production azo dyes. No. 2,124,881. Werner Lange, Dessau-Ziebigk-in-Anhalt, Germany, to General Aniline Works, New York City.

Preparation compounds of the 3.4.8.9-dibenzopyrene-5.10-quinone series; vat dyestuffs. No. 2,124,891. Heinrich Neresheimer, Robt. Held, and Anton Vilsmeier, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, New York City.

Preparation azo dyestuffs on the fiber by means of a diazo compound, coupling latter in alkaline solution in presence of a water-soluble salt of a non-coupling base. No. 2,124,899. Willy Tischbein, Leverkusen-Wiesdorf, Germany, to General Aniline Works, New York City.

Production azo dyestuffs from coupling components and such diazo-amino compounds as contain acid solubilizing groups in the radical attached to the amino nitrogen and can be split off into the diazo compound and the amine by a reduction in the alkalinity of the preparation. No. 2,125,087. Albert Schmelzer, Cologne, Germany, to General Aniline Works, New York City.

Production azo dyestuffs. No. 2,125,625. Detlef Delfs and Otto Bayer, Leverkusen-I. G. Werk, Germany, to General Aniline Works, New York City.

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Flaked sulfur dye, having the physical form of hard, shiny flakes or grains, comprising sodium sulfide and a sulfur dye free from uncombined sulfur. No. 2,125,981. George Barnhart, Woodbury, N. J., and Herbert A. Lubs, Wilmington, Del., to du Pont, Wilmington, Del.

### Explosives

Explosive composition comprising an explosive matrix capable of sustaining propagation of the explosion upon initiation, having embedded in matrix, aggregates comprising ammonium nitrate intermingled with an oxygen acceptor. No. 2,124,201. Harold A. Lewis, Brandywine Summit, and Clifford A. Woodbury, Media, Pa., to du Pont, Wilmington, Del.

Water-resistant, semi-gelatinous ammonium nitrate dynamite containing at least one liquid explosive nitric ester colloided by means of nitrocellulose, a water-insoluble soap, and a composition containing coarse ammonium nitrate. No. 2,124,202. Harold A. Lewis, Wilmington, Del., and Fred R. Wilson, Swarthmore, Pa., to du Pont, Wilmington, Del.

Priming composition consisting of normal lead dinitroresorcinate and black powder. No. 2,124,568. George C. Hale and William H. Rinkenbach, Dover, N. J.

Priming composition consisting of normal lead dinitroresorcinate and tetracene. No. 2,124,569. George C. Hale and William H. Rinkenbach, Dover, N. J.

Priming composition consisting of normal lead dinitroresorcinate and nitrocellulose. No. 2,124,570. George C. Hale and William H. Rinkenbach, Dover, N. J.

High explosive composition characterized by low density, comprising an organic explosive sensitizing agent and ammonium nitrate. No. 2,125,-161. Thorvald W. Hauff and William E. Kirst, Woodbury, N. J., to du Pont, Wilmington, Del.

Blasting cap for detonating explosives and a charge of hexanitrodiphenylethylenedinitramine. No. 2,125,221. Richard F. B. Cox of Hercules Powder Co., both of Wilmington, Del.

Blasting cap, base charge of which comprises guanyl azide picrate. No. 2,125,462. Leon Rubenstein, Saltcoats, Scotland, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Manufacture nitric acid esters and explosives. No. 2,125,941. Oskar Matter, Vitznau, Switzerland, to Societe d' Exploitation des Brevets O. Matter-S.E.B.O.M., Bourges, France.

Purification deteriorated trinitrotoluene; contacting molten but undissolved trinitrotoluene with an acid mixture consisting of sulfuric and nitric acids and water. No. 2,126,162. Joseph A. Wyler, Allentown, Pa., to Trojan Powder Co., corp. of New York.

Manufacture explosive having rate of detonation of 2500 to 8000 ft. per second, as determined by the Cordeau Bickford method, adapted for blasting purposes. No. 2,126,401. Milton F. Lindsley, Jr., to King Powder Co., both of Kings Mills, O.

### Fine Chemicals

Method increasing brilliancy of photographic pictures and composition therefor. No. 2,124,159. Edith Weyde, Cologne-Niehl, Germany, to Agfa Ansco Corp., Binghamton, N. Y.

Process developing an exposed silver-halide emulsion in color; treating emulsion, in presence of an iso-oxazolone, with an aromatic amino developer, the oxidation product of which forms a colored compound. No. 2,124,612. John Eggert, Leipzig-Gohlis, and Bruno Wendt, Dessau, Germany, to Agfa Ansco Corp., Binghamton, N. Y.

Manufacture aromatic alcohol having formula $R(C_nH_{2n})OH$. No. 2,125,490. Harold S. Davis to Calco Chemical Co., both of Bound Brook, N. J.

Hydrogenated brown camphor oil having odor three times strength of the starting material, produced by complete hydrogenation of the unsaturated side chain of brown camphor oil. No. 2,125,832. Marion Scott Carpenter, Nutley, N. J., to Givaudan-Delawanna, Inc., New York City.

Production amide derivatives of isoxazole carboxylic acids. No. 2,126,-329. Max Hoffer, Basel, Switzerland, to Hoffmann-La Roche, Inc., Nutley, N. J.

### Glass and Ceramics

Method applying luminescent colors on bodies consisitng of glass or like material. No. 2,123,939. Edmund Germer, Berlin, Germany.

Production safety glass; glass sheets combined by means of a layer comprising an isobutylene polymer having molecular weight of at least about 1000. No. 2,124,235. Martin Mueller-Cunradi, Michael Otto, Walter Daniel, and Robert Werner, Ludwigshafen-on-the-Rhine, Germany, to I. G., Frankfort-on-Main, Germany.

### Industrial Chemicals, etc.

Production hydrated magnesia, in a readily settling and filtering form, from magnesia bitterns containing NaCl and $MgCl_2$, by reaction between quicklime and the $MgCl_2$. No. 2,124,002. Marion G. Mastin, Graceland Park, Redwood City, Calif., to Westvaco Chlorine Prods. Corp., New York City.

Process extracting fatty acids and glycerine directly from oleaginous pulp material, using reagent comprising sulfuric acid, alcohol, a hydrolyzing catalyst, fatty acids and benzole. No. 2,124,168. William H. Rees, Berkeley, Calif., to El Dorado Oil Works, San Francisco, Calif.

Production diiodoacetylene; reacting a metal carbide with iodine in liquid ammonia. No. 2,124,218. Thomas H. Vaughn, Niagara Falls, N. Y., to Union Carbide & Carbon Corp., New York City.

Treatment cellulosic fibrous materials; subjecting same to action of an aqueous caustic alkaline solution to which has been added methylene blue. No. 2,124,256. Erwin Mayer, Skoghall, Sweden.

Vacuum distillation of hydrogen peroxide. No. 2,124,257. Jean Mercier, Neuilly-sur-Seine, France.

Gas purifying material for separating sulfur from sulfur-containing gases comprising lava foam. No. 2,124,260. Ferdinand Christoph Post to Compagnie des Produits Chimiques et Charbous Actifs Edouard Urbain, both of Paris, France.

Production ester of a substituted acrylic acid; reacting an ethyl ketonecyanamine with an alkyl sulfuric acid ester and deaminizating, by diazotization, the resulting product. No. 2,124,272. Carleton Ellis, Montclair, N. J., to Ellis-Foster Co., corp. of N. J.

Preparation rapid drying mixed ester devoid of gumminess and having sufficient solubility for use as an ingredient of paint; esterifying a phenol-aldehyde resin with a mixture of linolic acid and colophony. No. 2,124,285. Hans Theodor Bucherer, Munich, Germany.

Method determining amount of sulfur in mixtures containing same. No. 2,124,307. Robert G. Mewborne, Albuquerque, N. Mex., and John F. Les Veaux, Middleport, N. Y., to Niagara Sprayer and Chem. Co., Inc., Middleport, N. Y.

Formation starch product; heating, in water, raw starch, in presence of a disintegration-inhibitor to a temperature sufficient to distend granules until their crosses disappear. No. 2,124,372. Carl C. Kesler, Cedar Rapids, Ia., to Penick & Ford, Ltd., corp. of Del.

Production formaldehyde; passing mixture of methyl alcohol in vapor phase and an oxygen-containing gas into contact with a catalyst mass consisting chiefly of a mixture of vanadium and molybdenum oxides. No. 2,124,388. John Morris Weiss, New York City, and Charles Raymond Downs, Yonkers, N. Y., to Bakelite Corp., New York City.

Method precipitating a metal from a cyanide solution; increasing hydrogen ion concentration of solution during precipitating operation to a value corresponding to a pH of about 3. N.o 2,124,421. Leonard Klein, Clarkdale, Ariz., to Phelps Dodge Corp., New York City.

Protection steel surfaces during annealing; by application, to surface, of a light lubricating oil containing a compound from the group of iron naphthenate and magnesium naphthenate. No. 2,124,446. James G. Detwiler to Texas Company, both of New York City.

Manufacture pyridine derivatives. No. 2,124,505. Erich Haack, Radebeul, and Rudolf Freiherr von Buddenbrock, Dresden, Germany, to Chemische Fabrik von Heyden A. G., Radebeul, near Dresden, Germany.

Production carbides of tantalum and like metals. No. 2,124,509. Philip M. McKenna, Latrobe, Pa.

Recovery alkali metal nitrates; cyclic process. No. 2,124,536. Herman A. Beekhuis, Jr., Petersburg, Va., to Solvay Process Co., New York City.

Removal mercury from mixture of mercury and an alkali metal; contacting mixture with a metal which will react with mercury to form an amalgam. No. 2,124,564. Harvey N. Gilbert and Norval D. Clare, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Process for hydrogen chloride esterification of alcohols obtained by hydrogenation of coconut oil. No. 2,124,605. Euclid W. Bousquet to du Pont, both of Wilmington, Del.

Preparation ketals. No. 2,124,686. Wallace H. Carothers and Harry B. Dykstra, to du Pont, all of Wilmington, Del.

Method retarding rancidity in oils and fats; incorporating therein the residue from the distillation of a spice oil. No. 2,124,706. Donald J. Maveety, Millburn, N. J., to National Biscuit Co., New York City.

Process of concentrating sulfuric acid in a closed system. No. 2,124,-729. James B. Castner and Ralph F. Peterson, Woodbury, N. J., to du Pont, Wilmington, Del.

Stabilization animal and vegetable fats and oils having tendency to become rancid; incorporating a phenol of the benzene series. No. 2,124,-749. Paul L. Salzberg to du Pont, both of Wilmington, Del.

Manufacture starch from corn, in which corn, after being steeped and comminuted is subject to germ, coarse slop and fine slop separations. No. 2,124,779. Alfred H. Kelling, Oak Park, Ill., to International Patents Development Co., Wilmington, Del.

Purification used lubricating oils; mixing same with an aqueous solution of sodium silicate. No. 2,124,814. Adolfo Silenzi de Stagni, Buenos Aires, Argentina.

Membrane waterproofing process; applying coating of coal-digestion pitch and asbestos fibres to ma s to be water-proofed, then applying layer of bitumen-saturated felt to this coating, and applying a second coating of like composition to the felt. No. 2,124,843. Benjamin A. Anderton, Grantwood, N. J., to Barrett Co., New York City.

Preparation halogen-substituted alcohols; causing formaldehyde and hydrogen halide to act upon a low-molecular aliphatic compound containing an olefinic double bond. No. 2,124,851. Wilhelm Fitzky, Frankfort-on-Main-Hochst, Germany, to I. G., Frankfort-on-Main, Germany.

In the process of high vacuum, the short path distillation of organic substances. No. 2,124,879. Kenneth C. D. Hickman to Eastman Kodak Co., both of Rochester, N. Y.

Direct and dry manufacture of completely water-soluble alkali metal beryllium fluorides. No. 2,125,026. Gustav Jaeger, Neu-Isenburg, Germany, to Deutsche Gold und Silber Scheideanstalt vormals Roessler, Frankfort-on-Main, Germany.

Manufacture artificial filaments; continuously applying a cellulosic solution to a moving line edge, dipping latter into a coagulant, simultaneously withdrawing incompletely coagulated filament from the line edge support and stretching filament. No. 2,125,032. Thomas Lewis Shepherd, London, England.

Molded laminated product; sheets of paper impregnated with a resinous binder suitable for molding, another sheet having a pigment dispersed throughout the body and impregnated with a resinous binder superimposed on the other sheets. No. 2,125,076. Gerald H. Mains, Murrysville, Pa., to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Production sulfuric acid from a hot gaseous mixture comprising $SO_2$, $SO_3$, and $H_2O$. No. 2,125,143. Fred C. Zeisberg to du Pont, both of Wilmington, Del.

Method refining sulfurized organic materials; treating said material, in crude form, in solution, in a solvent inert thereto, with an anhydrous halide of an amphoteric element. No. 2,125,218. Joseph N. Borglin to Hercules Powder Co., both of Wilmington, Del.

Electro-deposition bath; comprising an acid nickel electrolyte, a brightening addition agent, and an aromatic sulfonate to counteract embrittling effect of brightener compound and render deposit ductile. No. 2,125,229. William J. Harshaw, Shaker Heights, and Kenneth E. Long, South Euclid, Ohio, to Harshaw Chemical Co., Elyria, Ohio.

Subjecting naphtha to an elevated temperature in absence of gaseous hydrocarbons and higher-boiling constituents to reform same. No. 2,125,-233. Pike H. Sullivan, New Rochelle, N. Y., to Gasoline Prods. Co., Newark, N. J.

Preparation ethyl chloride; passing ethylene and hydrogen chloride into an anhydrous bath of ethyl sulfuric acid. No. 2,125,284. Leonard C. Chamberlain and Jack L. Williams to Dow Chemical Co., all of Midland, Mich.

Process oxidizing elemental phosphorus. No. 2,125,297. John N. Junkins, Sheffield, Ala.

Method of alkylating phenols; heating latter with a monohydric alcohol containing at least six carbon atoms in presence of an acid activated bleaching earth. No. 2,125,310. Ralph P. Perkins to Dow Chemical Co., both of Midland, Mich.

Production ethylene oxides; subjecting gaseous mixture of ethylene and oxygen to contact with a catalyst consisting of a carrier which is fused aluminum oxide and silver. No. 2,125,333. Ray M. Carter, Glenbrook, Conn., to U. S. Industrial Alcohol Co., New York City.

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Process oxidizing trivalent titanium to tetravalent titanium; contacting solution containing same with elemental oxygen in presence of an added copper compound as catalyst. No. 2,125,340. Charles R. Hager, Baltimore, Md., to du Pont, Wilmington, Del.

Manufacture pigment barium sulfate from barium chloride. No. 2,125,-342. Daniel C. Hall, Silview, and Edward F. Steinbring, Wilmington, Del., to du Pont, Wilmington, Del.

Modification viscosity or water-solubility of composition comprising a water-soluble polymerized vinyl compound; subjecting same to action of Congo red. No. 2,125,374. Willy O. Herrmann, Deisenhofen, and Wolfram Haehnel, Munich, Germany, to Chemische Forschungsgesellschaft m.b.H., Munich, Germany.

Method inhibiting polymer formation in a boiling formaldehyde solution; adding to same sulfur dioxide in amount less than that required for saturation. No. 2,125,375. Wilbie S. Hinegardner, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Method rendering a solid material water-resistant; coating surface of same with an acyloin derived from a fatty acid having more than six carbon atoms per molecule. No. 2,125,376. Harold S. Holt to du Pont, both of Wilmington, Del.

Production sodium cyanide containing more than 97% sodium cyanide; contacting hydrocyanic acid gas with an active carbonate in the solid state. No. 2,125,377. Harry J. Hosking, Brooklyn, N. Y., to du Pont, Wilmington, Del.

Stabilization of chlorinated compounds; composition comprising trichlorethylene and stabilizing amounts of triphenyl guanidine. No. 2,125,381. Arthur A. Levine and Oliver W. Cass, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Method refining a crude lactic acid solution; distilling same and adding to condensate hydrogen peroxide. No. 2,125,383. Alexander Douglas Macallum, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Preparation ethynyl carbinols; reacting sodium acetylide with an alkylene oxide in presence of liquid ammonia. No. 2,125,384. Alexander Douglas Macallum, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Method effecting addition of an alkali metal to a polycyclic aromatic hydrocarbon which will form addition compounds. No. 2,125,401. Norman D. Scott, Sanborn, N. Y., to du Pont, Wilmington, Del.

Process for hydrogenating polynuclear aromatic ketones. No. 2,125,412. Herrick R. Arnold and Crawford H. Greenewalt to du Pont, all of Wilmington, Del.

Method bright-pickling products of copper-zinc alloys; first pickling same in an aqueous solution of chromic and hydrochloric acids, rinsing, then pickling in aqueous solution of chromic acid only. No. 2,125,458. Friedrich Ostermann, Menden, Germany, to Georg von Giesche's Erben, Breslau, Germany.

Treatment vegetable or animal oil containing an oxyacid radical with a boron compound, resulting in a tough resilient product that will flow slowly when it is cold. No. 2,125,544. Ivor M. Colbeth, East Orange, N. J., to Baker Castor Oil Co., New York City.

Recovery Glauber's salt from natural brine containing sodium sulfate; using sodium chloride in process. No. 2,125,624. Sidney H. Davis, Henry W. Doennecke, and Emory W. Douglass, to Ozark Chem. Co., all of Tulsa, Okla.

Production lead glazes; introducing lead into preparation to be fritted in form of a lead-sulfate-containing substance, and reduction of sulfate during fritting by means of a powderous metal. No. 2,125,632. Hermann Harkort, Berlin, Germany.

Method bleaching pulp or paper web; using solution of hydrogen peroxide. No. 2,125,634. Clark Cable Heritage, Rumford, Maine, to Oxford Paper Co., corp. of Maine.

Production polymerization products; polymerizing a vinyl ether of a mercaptan in presence of sulfur dioxide. No. 2,125,649. Walter Reppe and Hanns Ufer, Ludwigshafen-on-Rhine and Erich Kuehn, Mannheim, Germany, to I. G., Frankfort-on-Main, Germany.

Production halogenated derivatives of sulfated unsaturated fatty alcohols; reacting unsaturated fatty alcohol with halogen sulfonic acid. No. 2,125,656. Walther Schrauth, Berlin-Dahlem, Germany, to "Unichem" Chemikalien Handels A.-G., Zurich, Switzerland.

Polymerizing a 4-substitution product of butadiene-1.2 by heating monomeric material to about its boiling point for at least 24 hours. No. 2,125,685. Otto Nicodemus, Heinrich Lange, and Otto Horn, Frankfort-on-Main-Hochst, Germany, to I. G., Frankfort-on-Main, Germany.

Process improving octane number and distillation curve of a heavy straight run naphtha. No. 2,125,714. Stewart C. Fulton, Elizabeth, N. J., to Standard Oil Development Co., corp. of Del.

Production hydrogen; passing a hydrocarbon gas and steam over a catalyst in form of pills comprising nickel and magnesia. No. 2,125,743. William J. Sweeney and William E. Spicer, Baton Rouge, La., to Standard Oil Development Co., corp. of Del.

Preparation sulfur monochloride-nitrile reaction products. No. 2,125,-853. Anderson W. Ralston to Armour & Co., both of Chicago, Ill.

Aluminum bronze powder, having property of complete leafing in a vehicle to present a brilliant smooth surface. No. 2,125,870. Furman C. Arthur, Oakmont, and Jesse Bryte Barnitt, Pittsburgh, Pa., to Aluminum Co. of America, Pittsburgh, Pa.

Production dyed artificial materials having an enhanced permanency to light, imparting scroop effect thereto, by depositing on said materials an acid compound. No. 2,125,902. George Holland Ellis and Ernest William Kirk, Spondon, near Derby, England, to Celanese Corp. of America, corp. of Del.

Process separating mixture of trimethylamine and ammonia. No. 2,125,905. Merrell R. Fenske, State College, and Chester E. Andrews, Overbrook, Pa., to Rohm & Haas Co., Phila., Pa.

Leather substitute for use as a midsole; felted fibrous product associated with a bonding medium consisting of rubber and containing a water insoluble soap. No. 2,125,947. Izador J. Novak to Raybestos-Manhattan, Inc., both of Bridgeport, Conn.

Manufacture aromatic alcohols; in a Friedel-Crafts reaction in which alkylene oxide is condensed with a Friedel-Crafts reactant and in which this reactant is a solid at the temperature of the reaction. No. 2,125,968. Ernst T. Theimer, East Orange, N. J.

Treatment gases containing polymerizing or resinifying substances; contacting gases with an artificially molded active carbon. No. 2,125,997. Alfred Engelhardt, Gonzenheim, near Bad Homburg, Germany, to Carbo-Norit-Union Verwaltungs-Gesellschaft, m.b.H., Frankfort-on-Main, Germany.

Preparation amino-chlorodiphenyl derivatives; compound selected from group consisting of 4-amino-2′-chlorodiphenyl and its inorganic acid addition salts. No. 2,126,009. Morton Harris, Anniston, Ala., to Monsanto Chemical Co., corp. of Del.

Manufacture soap and glycerin. No. 2,126,099. Robert A. Duncan, Wyoming, Ohio, to Procter & Gamble Co., Cincinnati, O.

Plasticized cellulose derivative composition containing carbamates as plasticizer. No. 2,126,113. Ralph A. Jacobson, to du Pont, both of Wilmington, Del.

Method removing oil compatibly associated with steam condensate; subjecting water containing said oil to action of a coagulum formed through reaction of ferric sulfate and an alkali. No. 2,126,151. Alverd C. Stutson, Webster Groves, Mo., to Monsanto Chem Co., St. Louis, Mo.

Stabilization vinyl resin against discoloration by light; intimately mixing with same a light-stabilizing phenol derivative having a single hydroxyl group and having an alkyl-substituted carboxyl group placed ortho to the hydroxyl group. No. 2,126,179. Fred W. Duggan, Lakewood, Ohio, to Union Carbide and Carbon Corp., corp. of New York.

Production cellulose esters of lower fatty acids. No. 2,126,190. Rudolf Hofmann, Dormagen, Germany, to Hercules Powder Co., Wilmington, Del.

Preparation diaryl methane water-soluble condensation products. No. 2,126,232. Arthur Voss, Frankfort-on-Main-Hochst, and Heinrich Janz, Bad Soden in Taunus, Germany, to I. G., Frankfort-on-Main, Germany.

Production organic deodorized solvents from vulcanized rubber; using aluminum chloride in process. No. 2,126,277. Francis Norman Pickett, London, England, to United States Rubber Prods., New York City.

Mineral concentration; admixing an ore with an insoluble and unsaponifiable oil and a sulfo-fatty acid compound, said compound being used to conjointly effect collection of said values. No. 2,126,292. Francis X. Tartaron, Mulberry, Fla., to Phosphate Recovery Corp., New York City.

Stable, neutral gelatin solution suitable for subbing a cellulose derivative film support, comprising gelatin, a weakly acidic dispersing agent for the gelatin, a solvent, and water. No. 2,126,305. George S. Babcock to Eastman Kodak Co., both of Rochester, N. Y.

Purification vegetable oils, etc., contacting same with a hydrated amine. No. 2,126,334. Siegfried Leonard Langedijk and Willem Coltof, Amsterdam, Netherlands, to Shell Development Co., San Francisco, Calif.

Process breaking emulsions; mixing with emulsified liquids castor oil that has been bleached by oxidation, then oxidized by blowing air through it. No. 2,126,368. Ivor Milton Colbeth, East Orange, N. J., to Baker Castor Oil Co., New York City.

Hair-treating compound; solution containing ammonium hydroxide and a sulfite of an alkali metal. No. 2,126,375. Ernest O. Frederics, Bronxville, and James C. Brown, Mt. Vernon, N. Y., Brown assignor to Frederics.

Process converting mineral oil into lower-boiling products, and apparatus. No. 2,126,400. Wm. G. Leamon, New York City, to Houdry Process Corp., Wilmington, Del.

### Leather

Manufacture finished leather articles; by application of a coating of liquids containing polymers of acrylic compounds, having property of drying on with formation of adhering layers, which are fast to water, tenacious, elastic and extensible and do not harden the grain side of the leather. No. 2,126,321. Hans Freudenberg and Philipp Haas, Weinheim, Germany, to Freudenberg & Co., G.m.b.H., Frankfort-on-Main, Germany.

### Metals, Alloys, Ores

Production permanent magnet; alloying metal of the group including tungsten, molybdenum, and tantalum with carbon-free iron. No. 20,800. Reissue. Reginald S. Dean, Washington, D. C., to Carboloy Co., corp. of New York.

Heat treated cast aluminum base alloy containing copper and vanadium, characterized by higher strength than the same alloy devoid of vanadium. No. 2,123,886. Edward F. Fischer, Cleveland, O., to Aluminum Co. of America, Pittsburgh, Pa.

Production metallic magnesium. No. 2,123,990. Konrad Erdmann, Radenthein, Austria, to American Magnesium Metals Corp., Pittsburgh, Pa.

Sintered alloy comprising chromium, tungsten, and carbon. No. 2,124,-020. Roy T. Wirth, East Cleveland, Ohio.

Method recovering tin from lead alloys, by treatment with molten caustic soda, wherein spent caustic reagent contains sodium stannate with or without other oxysalts. No. 2,124,180. Gustave E. Behr to National Lead Co., both of New York City.

Production metals and alloys poor in carbon and silicon. No. 2,124,-262. Frans Gustaf Samuelson, Ossian Henrik Jonson, and Klas Jonas Henrik Engdahl to Wargons Aktiebolag, all of Wargon, Sweden.

Stable, aqueous colloidal dispersion of metals. No. 2,124,331. Max Bockmuhl, Eugen Dorzbach and Walther Persch, Frankfort-on-Main-Hochst, Germany, to Winthrop Chemical Co., New York City.

Production magnesium base alloy containing also lead, manganese, and zinc. No. 2,124,537. William O. Binder, Niagara Falls, N. Y., to Dow Chem. Co., Midland, Mich.

Manufacture a metallic composition containing boron carbide crystals. No. 2,124,538. John A. Boyer, to Carborundum Co., both of Niagara Falls, N. Y.

Production magnesium base alloys. Nos. 2,124,552-3-4-5-6-7-8-9-60-1-2-3. John A. Gann to Dow Chemical Co., both of Midland, Mich.

Production magnesium base alloys. Nos. 2,124,571-2. Joseph D. Hanawalt and Charles E. Nelson to Dow Chem. Co., all of Midland, Mich.

Production alloy containing tellurium and tin. No. 2,124,589. John V. O. Palm and Carl E. Swartz, Cleveland Heights, O., to Cleveland Graphite Bronze Co., Cleveland, Ohio.

Electroplating a base having a smooth surface; using cadmium, nickel and chromium in process, also an acetic acid solution. No. 2,124,657. Philip J. Ritzenthaler and Patrick J. Sheehan, to Cutler-Hammer, all of Milwaukee, Wisc.

Production of a copper-containing coloring matter of the phthalocyanine series; heating corresponding metal-free coloring matter in an organic solvent in presence of a substance capable of yielding copper atoms. No. 2,124,742. Reginald Patrick Linstead, London, and Charles Enrique Dent, Manchester, England, to Imperial Chemical Industries, Ltd., corp. of Great Britain.

Method purifying magnesium; first intimately mixing molten metallic material with a solid chlorine-free refining agent. No. 2,124,957. Georg Schichtel, Radenthein, Austria, to American Magnesium Metals Corp., Pittsburgh, Pa.

Electrical contact member composed of cadmium, nickel, silicon, and copper. No. 2,124,974. Franz R. Hensel to P. R. Mallory & Co., both of Indianapolis, Ind.